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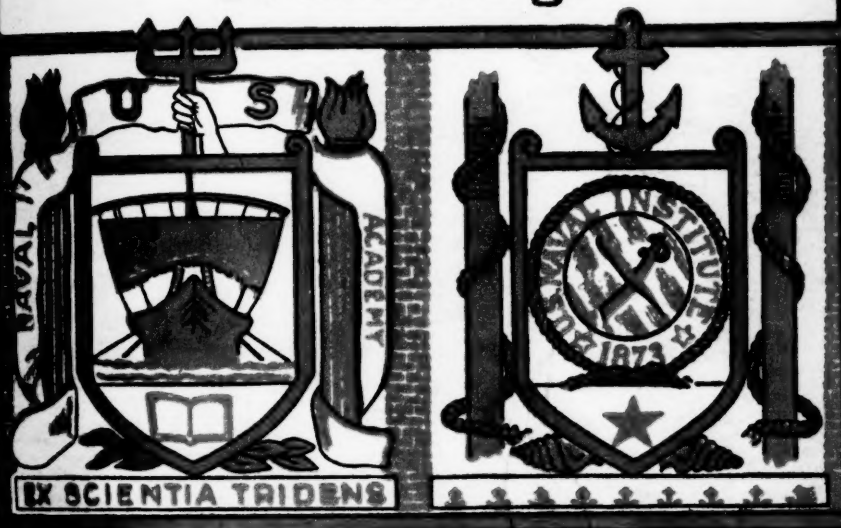

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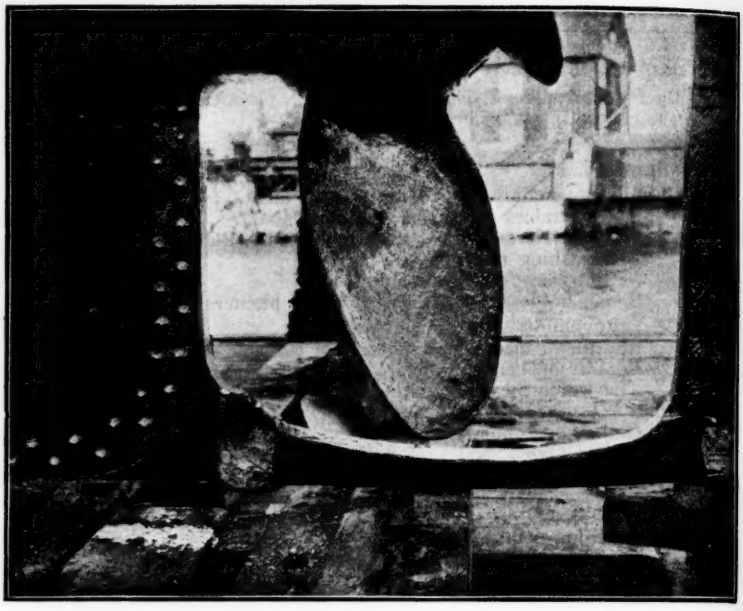

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Membership

Since January 23, 1914, thirty-six regular and seven associate members have joined the Institute; one member has resigned. The following members have died:

Captain Richard Henderson, U. S. Navy, retired.

Lieut. Commander R. I. Curtin, U. S. Navy.

The need for more members continues; bi-monthly publication should make the PROCEEDINGS more than ever valuable and necessary in keeping up with the naval profession; all members are asked to help in increasing the membership.

Naval Academy Graduates' Association Department

Attention is invited to the Naval Academy Graduates' Association Department in this number, wherein announcement is made of the arrangements for the annual dinner.

Extra Publications

The Institute announces two new books—"A French Phrase Book and Nautical Reader" and "A Spanish Phrase Book and Nautical Reader"—which have been prepared by instructors in the Department of Modern Languages, U. S. Naval Academy.

These two books are designed to give a nautical vocabulary while learning the language. They are also intended as works of ready reference for officers afloat.

There is a table of relative naval ranks in different navies, including the leading South American and European services.

Part 1 of each book is a re-edited excerpt from "Nautical Phraseology (1911)," compiled by Commander S. V. Graham, U. S. N. A series of elementary conversations between the leaders of two allied forces has been introduced; this feature

should prove of considerable value in cases where armed bodies are landed to protect life and property in foreign countries.

Part II contains the following reading matter: A Military Port, A Navy Yard, On Board Ship, Admiral Togo's Original Report after the Battle of Tsushima, The Night of the Watch, (an original French story of a spirited torpedo-boat attack).

Notice

Whole No. 145 of the PROCEEDINGS (March, 1913) is exhausted; there are so many calls for single copies of this number that the Institute offers to pay for copies thereof returned in good condition at the rate of 25 cents per copy.

ANNAPOLIS, MD., MARCH 18, 1914.

THE L-1 ACCOMPANYING THE GERMAN FLEET DURING MANEUVERS NEAR HELGOLAND

A. Renard, Kiel

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Prize Essay, 1914

THE GREAT LESSON FROM NELSON FOR TO-DAY

By Lieut. Commander D. W. Knox, U. S. Navy

Motto: "Intelligent co-operation is of infinitely more value than mechanical obedience."—Henderson

INTRODUCTION

The period from 1778 until the battle of Trafalgar, in 1805, is in many respects the most remarkable, from a naval standpoint, of the world's history. During the first five years of this period a purely maritime war was waged between the two greatest naval powers, and latterly for twelve years Europe was in a continuous turmoil both ashore and afloat. Within this short epoch of twenty-seven years were fought more actions between large organized fleets than is recorded in history since the galley period. On the following page are shown in tabular form the principal naval battles of this interesting period.

Besides the major actions tabulated on next page there were also many engagements between smaller groups of ships.

In all this long list of battles only three can be considered as really decisive actions in the sense of resulting in the annihilation of one of the fleets as an organized force. It is true that Rodney's last fight terminated in the disordered retreat of the French, but not a single French ship was captured or sunk, and the fleet as such remained intact. The same general comment is applicable to the victory of Suffren over Hughes in their last encounter.

THE L-1 ACCOMPANYING THE GERMAN FLEET DURING MANEUVERS NEAR HELGOLAND

A. Renard, Kiel

Excepting the three Nelson successes (Nile, Copenhagen and Trafalgar), those of Rodney and Suffren were the only ones in which more than a slight advantage was gained by either side. In most cases the result was indecisive.

It is needless to dwell upon the completeness of the victories of Nelson. At the Nile but two French ships of the line out of the original thirteen escaped, the remainder being either blown up, captured or driven ashore. At Copenhagen, where the presence of shore batteries prevented reaping the full fruits of victory, five enemy ships, out of a total of seven, were punished very severely indeed. At Trafalgar but fourteen enemy ships out of

Date	Battle	British fleet; ships of the line	Commander	Opposing fleet; ships of the line	Commander	Victor
1778	Ushant.....	30	Keppel ...	30	D'Orvilliers	Indecisive
1779	Grenada.....	21	Byron	25	D'Estaing..	Indecisive
1780	Off Cadiz.....	20	Rodney...	11	Langara....	British
1780	Dominica	20	Rodney...	24	Guichen....	Indecisive
1781	Martinique	18	Hood.....	24	DeGrasse...	Indecisive
1782	Off Gibraltar...	34	Howe.....	49	Allies.....	Indecisive
1782	Nevis	22	Hood.....	29	DeGrasse...	British
1782	The Saints.....	36	Rodney...	33	DeGrasse...	Indecisive
1782	The Saints (2d)	31	Rodney...	30	DeGrasse...	British
1782	Madras.....	9	Hughes...	12	Suffren.....	Indecisive
1782	Trincomalee ...	11	Hughes...	12	Suffren.....	Indecisive
1782	Cuddalore.....	11	Hughes...	11	Suffren.....	Indecisive
1782	Trincomalee ...	12	Hughes...	14	Suffren.....	Indecisive
1783	Cuddalore.....	18	Hughes...	15	Suffren.....	French
1795	Off Leghorn....	14	Hotham ..	15	Martin	Indecisive
1795	Hyeres Island..	23	Hotham ..	17	Martin	Indecisive
1797	St. Vincent.....	15	Jervis	27	Martin	British
1798	Nile	10	Nelson ...	13	Brueys	British
1801	Copenhagen....	11	Nelson ...	7*	Fischer.....	British
1805	Ferrol	15	Calder....	20	Villeneuve.	Indecisive
1805	Trafalgar	27	Nelson ...	33	Villeneuve.	British

* Also shore batteries.

thirty-three escaped capture or destruction, while the British lost no ships, and all were in good enough condition to weather the storm which shortly followed the fight, and to return shortly to England.

Measured by the success of contemporary fleet commanders, that of Nelson was truly amazing. Are the underlying causes of it of no greater than merely historical interest to us? Is there no lesson which *we* at *this time* can learn from him and apply in a practical fashion to the benefit of our own service today? His weapons of course were far different from those of the present, but it has become a platitude to say that the principles of warfare are immutable and quite independent of weapons. Certainly within the short hundred and odd years that have gone by since

Trafalgar, there has been no change in the nature of man, which is, after all, the primary factor in war.

It would seem, then, that to examine the elements of Nelson's victories and to analyze his methods as compared with those of less successful contemporaries might be of profit to naval officers of this more modern age. It goes without saying, of course, that such brilliant achievement was probably the result of a number of factors in combination, rather than of but a single one. If these factors were present in comparable degree in the operations of other admirals of his time, then it cannot be in them alone, common to the many, that the essence of the great admiral's success lay. If on the other hand he possessed qualities or used methods radically different from other men and peculiar only to himself, it is but reasonable to assume that in them lies the difference between mediocrity and brilliance.

Of course there are certain well known, fundamentally necessary qualities, such as courage, tenacity, combative ardor, tactical insight, activity, and will power. With these Nelson was undoubtedly very highly gifted. Yet Suffren, Hughes, Rodney, Jervis and Hood were no mean men in these respects, and hardly enough inferior to Nelson to account for the difference in the degree of results attained. Similarly the quality of ships, weapons and subordinate commanders of these men were about on the same level with those of Nelson.

Many will say that each of the trio of great victories can be *duly* explained by the presence of genius on the spot. But we *know* that at the Nile and Trafalgar the preliminary signals were very few and very general in character, and that signals during the action to any ships, except those in the localized area of the flagship, were fewer still. This hypothesis does not furnish a satisfactory solution.

In one essential quality Nelson did far outshine the other admirals. He had the gift of a contagious personality capable of inspiring great personal loyalty. While this was an asset of high value, it was not, as the writer reads history, the one conspicuous difference between Nelson and the others, which mainly contributed to his unprecedented successes.

In order to furnish a better basis for opinion as to the somewhat elusive reason for the superlative merit of the great admiral, it is desirable first to examine his experience before reaching chief

command, and to determine, if possible, what influence the earlier training may have had to produce the divine spark of genius exhibited in his later career.

NELSON'S SCHOOLING FOR CHIEF COMMAND

Although Nelson entered the British Navy in 1770, and his early service was attended by many minor engagements, both ashore and afloat, he was not so fortunate as to participate in any of the numerous fleet actions of the period until those fought by Hotham in 1795. His keen professional interest had been awakened long ere this however, and as early as 1782 Lord Hood, a very accomplished officer and tactician, and a good judge of men, is reported to have said that Nelson knew as much about naval tactics as any officer in the British fleet.

To estimate the view held by Nelson at a later period on some tactical questions, let us consider his own comments on the operations of Hotham's fleet in 1795 against the French. Referring to a three days' chase which resulted only in a detached engagement between the *Agamemnon* (his own ship) and the *Ça Ira,* he says: "On looking around," before opening fire, "I saw no ship-of-the-line within several miles to support me." In discussing this situation Mahan says "it seems difficult to imagine that among all the other thirteen captains . . . . none could have been present on the spot to support so promising an attempt, had there been 'common' that sort of emulation which takes a man ever to the front." Picture similar reflections in Nelson's keen mind during three long days of chase. Is it improbable that then and there conviction arose in him as to the prime necessity among fleet captains for "common emulation"?

Commenting upon the partial fleet action of the following day, he says: "I went on board Admiral Hotham as soon as our firing grew slack in the van, and the *Ça Ira* and the *Censeur* had struck, to propose to him leaving our two crippled ships, the two prizes and four frigates, to themselves, and to pursue the enemy; but he, much cooler than myself, said, 'We must be contented; we have done very well.' Now, had we taken ten sail, and had allowed the eleventh to escape, when it had been possible to have got her, I could never have called it well done." Here is seen the conception of the annihilation of the enemy fleet as a whole, which doctrine he so strongly insisted on in after years to his captains.

Four months later the same fleets again engaged in a partial fleet action, upon which Nelson commented as follows: "The scrambling distant fire was a farce, but if one (French ship) fell by such a fire, what might not have been expected had our whole fleet engaged? Improperly as the part of the fleet which fired got into action, we took one ship; but the subject is unpleasant and I shall have done with it." Mahan thinks it probable that the poor work of Hotham in this fight may have been responsible in part for the opening sentence of the famous "Memorandum," to wit: "Thinking it almost impossible to bring a fleet of forty sail of the line into a line of battle in variable winds, thick weather, and other circumstances which must occur, without such loss of time that the opportunity would probably be lost of bringing the enemy to battle in such a manner as to make the business decisive." Mahan also thinks that this fight may have inspired another great principle of the immortal "Memorandum." Rear Admiral Man was the senior officer of the advance force which succeeded in bringing part of the French fleet to action. Hotham was so far astern as to be unable to see the state of affairs in the van, yet he made signal to cease action and Man obeyed. Nelson blamed Hotham, but not Admiral Man, saying of the latter: "He is a good *man* in every sense of the word." Considering Nelson's disgust over the whole affair it is not too much to assume that this incident had some influence on that part of the "Memorandum" which read originally: "The second in command will in fact command his line and, after my intentions are made known to him, have the entire direction of his line to make the attack upon the enemy, and to follow up the blow until they are captured or destroyed." Mahan says of this: "Whether such words be regarded as the labored result of observation and reflection, or whether as the flashes of intuition, with which genius penetrates at once to the root of the matter, without the antecedent processes to which lesser minds are subjected, in either case they are instructive when linked with the events of his career here under discussion, as corroborative indications of natural temperament and insight, which banish altogether the thought of mere fortuitous valor as the one explanation of Nelson's successes."

The next fleet action in which Nelson was personally engaged was that of Cape St. Vincent in 1797, in which he won promotion to the grade of rear admiral by his celebrated act of taking

initiative and responsibility far beyond that countenanced by the custom of the day.

There is a popular belief concerning this act of Nelson, that the initiative displayed had no other justification than that of the immediate tactics of "position," coupled perhaps with the fact that the outcome was brilliantly successful. Commander Schofield has pointed out, however, that Nelson's initiative in this case was not unrestrained nor wholly independent. A close analysis of the circumstances shows that it was the expressed plan of Jervis to prevent a junction between the two detachments of the enemy. Nelson had knowledge of this general plan. Through an error of judgment the maneuver of tacking the British fleet in succession was begun too late to ensure the success of the general plan of preventing the junction. Being in a position to observe this fact more accurately than could the Commander-in-Chief from his position, Nelson merely complied with the spirit of the general plan instead of executing an order for interior maneuver issued for the sole purpose of accomplishing the broader objective. Considered from this aspect Nelson's course had in it none of the elements of insubordination common to unrestrained independent initiative. On the other hand it was loyal and subordinate in the broadest and best sense, and it would be a bigoted critic indeed who would be unwilling to concede that this type of initiative is not only justifiable but very desirable from every point of view.

Now it seems clear from what has been said that Nelson's tactical sense had reached a high state of development even before he came into chief command. This of course stood him in good stead in the serious work that was in store. It is apparent, too, that, even at this time, he recognized the necessity for sound tactical knowledge on the part of all captains. The incidents cited lead also to the belief that his ideas had taken definite form on such questions, as (1) the undesirability of the commander-in-chief directing in action the detailed movements of all his forces; (2) the necessity for mutual and more or less automatic support, as occasion required, between ships of the same side in action; (3) the advisability of entrusting proper initiative to subordinates.

But whatever probabilities may be deduced from his previous experience, the methods which Nelson put into practice after attaining independent command speak for themselves, and it is essential to our purpose that they be examined.

NELSON'S METHOD OF PREPARING A FLEET FOR BATTLE

Upon assuming command of an independent detachment of Jervis' fleet Nelson initiated certain methods which, as far as the writer is aware, had never before been put into practice, and have never since been tried afloat. While it would be too much to say that his remarkable successes were primarily due to these methods, the reader will be left to answer for himself the question of how much the methods contributed to Nelson's achievements as well as the question of whether, with the same system in force, Suffren, Rodney, Jervis, Hughes and Hood, would not have approached much more closely the magnitude of their great contemporary.

Referring to the period preceding the battle of the Nile Mahan, who has examined a great number of historical papers relating to Nelson, says: "Nelson's own mind was, by constant pre-occupation, familiar beforehand with the bearings of the different conditions of any situation likely to occur, and with the probable inferences to be drawn; his opinions were, so to say, in a constant state of formation and development, ready for instantaneous application to any emergency as it arose. But he had, besides, exercised the same habit in the captains of the ships, by the practice of summoning them on board the flagship, singly or in groups; the slow movement of sailing vessels, particularly in the light summer weather of the Mediterranean, permitting such intercourse without materially affecting the progress of the fleet. Invitations or commands to visit the flagship were common." In his book "Nelson and His Captains," Fitchett has made the following interesting comments, pertinent to this subject: "Nelson, in addition, throughout the whole of that memorable cruise turned the quarterdeck of the *Vanguard* into what can only be described as a perpetual 'school for captains.' Whenever the weather admitted, he summoned the captains on board the flagship, where, says Berry (Nelson's flag captain), 'he would fully develop to them his own ideas of the different and best modes of attack and such plans as he proposed to execute upon falling in with the enemy. Whatever their position or situation might be by night or day!' . . . . 'There was no possible position in which they could be found that he did not take into his calculations, and for the most advantageous attack of which he had not digested and arranged the best possible plans. With the masterly ideas of their

admiral, therefore, on the subject of naval tactics, every one of his captains was most thoroughly acquainted!'" "This explains why," continues Fitchett, "when the moment of attack came—and came suddenly—signals were so little needed. . . . . Nelson in a word was so charging the minds of his captains with his plans, that when the moment for action came . . . . there was no need to spell out clumsily by signal what their admiral wanted them to do. They were already saturated with that knowledge."

In these methods are seen the fruits of his reflections and study, and of his experiences in action in a subordinate capacity. It should be observed that the frequency, duration and scope of the "talks" on the *Vanguard* amounted to far more than mere "charging the minds of his captains with his *plans*." He was, literally, *educating* them in *tactics*. Evidently the need for wide tactical education among captains of the fleet had been impressed previously upon his mind, together with the desirability for captains and admirals being indoctrinated with common tactical conceptions, understandings and creeds. Under the conditions of sea fights, having in mind particularly the restricted view of the commander-in-chief, the difficulties of communication between ships, and more especially the *time* factor, such education and indoctrination were then, and still are, absolutely essential to unity of action in battle.

HOW THE METHOD WORKED AT THE NILE

Notwithstanding the grueling disappointments and delays, extending over two months, incident to the search for the French fleet before the battle of the Nile, it is probable that this period of postponement, utilized as has been described, contributed materially to the decisiveness of the British victory.

From the moment the French were reported in Aboukir Bay until the end of the battle, the movements of the British ships indicated a remarkable freedom from doubt and indecision on the part of the various commanders. To a degree unknown before, all seemed to know what to do, and proceeded to do it; expeditiously and without specific detailed direction, but with common purpose and mutually supported unified action. As compared with former fleets, that of Nelson at this battle was like an automatic machine, which once started, performed its work with precision and despatch, all parts working usefully, harmoniously, and co-ordinately, to a single end.

The French fleet was sighted at anchor in Aboukir Bay at about 2.45 p. m. To go around the shoals separating it from the British fleet would require considerable time, and leave but scant daylight with which to conduct the action.

Time was too pressing to permit a conference of captains on the flagship; indeed, if the rare opportunity was to be taken full advantage of, there was hardly sufficient time to make more than a hasty estimate of the situation, decide the general outline for the attack, and to get the necessary signals for the proposed movements through to the fleet. The situation was one which emphasizes the extraordinary value to an admiral of a mind duly prepared by constant study and reflection, and of a set of captains to whom the decisions can be made clear by a few simple signals. While rounding the shoals they were told by flag signal to prepare for battle, to prepare to anchor by the stern, and that the commander-in-chief intended to attack the enemy's van and center. Nothing further was sent, nor were any further instructions necessary to make the general plan clear to assistants so well prepared by previous discussion and enlightenment.

Only those who have commanded in trying circumstances can fully appreciate how great Nelson's temptation must have been to issue voluminous detailed instructions and orders, from time to time during the approach to this battle, for the purpose of ensuring exact understanding of his plan. It would have been a natural and human thing to do, and is a general habit of action which may be observed almost daily in our own service. His "school for captains" had existed but a few months and grave doubts must have arisen in his mind as to the thoroughness of his education and the certainty of his indoctrination being all-sufficient to the proper interpretation of his few simple signals. Many strong impulses to make doubly sure by lengthy confirmatory detailed signals must have been resisted. He realized, as few have done, that under the tenseness preliminary to battle verbose detailed instructions lead only to confusion, and that in so burdening the minds of subordinates one not only decreases the clearness with which they grasp the general plan, but may even lead them to give undue attention to specified details, at the expense of greater affairs. He appreciated that the opportunity for naval genius to accomplish its work is during the months

or years before the day of encounter; that the work of the commander-in-chief is primarily one of preparation. The eve of battle is too late to shape its destiny; no amount of detailed orders or instructions promulgated then can materially influence the issue for good, but may on the other hand by creating confusion, work untold harm.

The fate of the day had been moulded beyond change during the preceding months, so Nelson held his counsel and refrained from supplementing his general signals; reserving only to himself the task of first leading the fleet around the dangerous and unknown shoals, and of later leading the six rear ships into action so that he might watch the operations of the first five, and if necessary give new directions to those which followed.

Great as was Nelson's physical courage, the writer considers that even greater moral courage was shown by him in so radically changing the methods of handling a fleet in action, and in adhering so rigidly to his method on the first crucial test. The temptation to revert to the conventional system was all the greater because the new method was such that it placed the issue almost unreservedly in the hands of subordinates, and because the responsibility for so doing was heightened by the grave crisis in the political affairs of England and of all Europe.

In the earlier stages of the fighting, before darkness and the confusion of the French fleet interfered with prompt and correct decisions and co-ordinate action on the part of British captains, "the method" worked admirably. The French van was soon crushed and the center fared little better. Only after victory was assured did Nelson, in an effort to make it the more decisive, "meddle" in its details. This was no doubt justified by the conditions then existing. Men and officers were worn out by many hours of ceaseless fighting.

Uncertainties arose in the minds of most captains as to what they should do, and how they should do it, now that the enemy van and center were practically crushed. Each hesitated to initiate a new movement, not being sure that his judgment would be correct nor that the concurrence of the others in such action as he might take would result in his being properly supported. Messages were exchanged between them but none felt their authority sufficient to order others. In other words, the fleet became disorganized, and harmonious, co-ordinated effort almost disappeared.

Before the fighting ceased the French as a fleet were annihilated, 11 out of 13 ships of the line being captured or destroyed. No such decisiveness of results had ever before been attained during the several centuries of the sailing ship era. Lord Howe commented that the battle "was unparalleled in this respect: that *every captain* distinguished himself." It is most interesting to note Nelson's own remarks on the fight, which indicate how clearly he appreciated the desirability for singleness of direction in sea fighting. He wrote: "I regret that one escaped, and I think, if it had pleased God that I had not been wounded, not a boat would have escaped to have told the tale; but do not believe that any individual in the fleet is to blame. In my conscience, I believe greater exertions could not have been made, and I only mean to say, that if my experience could in person have directed those exertions of individuals, there was every appearance that Almighty God would have continued to bless my endeavours." Inasmuch as he was not wounded until after victory had been assured and until more or less confusion had set in, and since he did not attempt to direct in person the exertions of individuals until after he was wounded, it is obvious that these remarks refer only to the latter stages of the battle, when the new "method" was somewhat shattered under the test. His subsequent battles go to show that these defects of the method were due only to lack of sufficient training in it, and not to incorrectness of principle, in a fleet so small.

Notwithstanding the clearsightedness with which Nelson saw the desirability for unified direction, he also understood the insuperable difficulties in the way of attaining the same with a large fleet in normal action by any other manner than his own newly created method. Perhaps during the later stages of the battle of the Nile, when both fleets had anchored and the normally paramount *time* element had become subordinated, the conventional practice of specific personal direction by the commander-in-chief was preferable to that which broadens the responsibilities and independence of subordinate commanders. It is at any rate clear from his comments that Nelson would have used the time-honored system during the latter part of this battle had he not been wounded. But in the light of subsequent history it is also certain that he was satisfied as to the soundness of his innovations for ordinary circumstances when handling a large fleet, and

was not dissuaded from persisting in them. Instead of reverting to the method used by all his predecessors and contemporaries—that of attempting the impossible task of issuing detailed directions from the flagship to meet each situation as it developed—he continued for the remainder of his career to perfect the method of command used at the Nile.

LOYALTY

There is one vitally essential link in the novel method of Nelson which has not so far been discussed. It is LOYALTY. Initiative, to a degree necessary for the united automatic action of a large number of units, cannot be safely allowed until the unit commanders are educated, trained, and indoctrinated. Neither can it be safely endowed until universal and unqualified loyalty to the general plan is assured. Initiative unrestrained by due loyalty leads to fatal dispersion of effort, because of the danger that some subordinate commanders may be tempted too far by the glamor of personal distinction or by the belief that some particular course of action is better than the one prescribed. Perhaps unconsciously, but certainly most effectively, Nelson, by his mere personality, inspired all with whom he came in contact with enthusiastic loyalty to himself. This was always a tremendous asset in his campaigns and battles, and is an important factor in determining his superiority over contemporary admirals. Whether he properly valued this quality is impossible to say positively, but his general bearing and actions towards all subordinates indicated that he did so value it. History abounds in incidents to show how uniformly and consistently he stimulated and fostered the loyalty of his subordinates.

Mahan tells us in emphatic terms that it was a lifetime habit, ingrained by temperament, for Nelson to be enthusiastic in praise for his subordinates. This characteristic was consistently in evidence throughout his entire career, and rarely did he have anything but praise for them. Soon after assuming command of his first ship in 1781 he wrote: "I have an exceedingly good ship's company; not a man or officer in her I would wish to change. . . . . I am perfectly satisfied with both officers and ship's company." In 1805, while in London consulting with the First Lord of the Admiralty concerning dispositions to be made before his assuming command of the fleet for the last time, he was asked

to express his preferences for ship commanders. His reply was, "Choose yourself, my Lord; the same spirit actuates the whole profession; you cannot choose wrong." Now, making all due allowance for a generous, charitable and impulsive nature, it can scarcely be fairly maintained that he was oblivious to the *military* value of stimulating the personal loyalty of his subordinates, nor that to some degree he did not do so studiously and deliberately. As is well known personal loyalty to a superior is to a great extent engendered by due loyalty of the latter to his subordinates. That is, "loyalty down" is an essential element in "loyalty up."

Of course, for military purposes, personal loyalty alone is inadequate to the end desired, namely, concerted action before, during, and after battle. The kind of loyalty necessary to this end is unanimous loyalty to the *general plan* promulgated by the superior. This is the type of military loyalty essential to the accomplishment of great results. But, while perhaps possible in some cases, the separation of "personal" from "plan" loyalty is normally difficult; human nature does not lend itself to it, and it is almost an axiom that the latter loyalty flows directly from the former. It is certainly true that the enthusiastic support given to Nelson's plans, even making due allowance for their excellence, was unusually great, and was no doubt colored by loyalty to his person.

In relating the incidents connected with his taking over command of the fleet just before the Battle of Trafalgar, Nelson himself wrote: "The reception I met with on joining the fleet caused the sweetest sensation of my life. The officers who came on board to welcome my return forgot my rank as commander-in-chief in the enthusiasm with which they greeted me. As soon as these emotions were past, I laid before them the plan I had previously arranged for attacking the enemy; and it was not only my pleasure to find it generally approved, but clearly perceived and understood." "I believe my arrival was most welcome, not only to the Commander of the fleet, but also to every individual in it; and, when I came to explain to them the '*Nelson touch*' it was like an electric shock. Some shed tears; all approved .... 'It was new—it was singular—it was simple!' and, from admirals downwards, it was repeated—'it must succeed, if ever they will allow us to get at them! You are, my Lord, surrounded by friends whom you inspire with confidence.' Some may be

Judases, but the majority are certainly much pleased with my commanding them."

Here is seen, at its best, the combination of "personal" and "plan" loyalty, closely interwoven. He would be bold indeed who would dispute that this combination contributed very largely to the great results which followed closely afterwards.

THE "METHOD" AFTER THE NILE

The confusion during the latter part of the Battle of the Nile showed merely that Nelson's method had not been perfected within the comparatively short time that it had been in operation. From time immemorial sea fights had been attended by confusion and unco-ordinated efforts, and under the circumstances at the Nile the wonder is that disorganization did not set in sooner.

After this battle, the same methods for training the fleet which had been adopted preceding it, were continued; interrupted, of course, from time to time by Nelson's absence from the fleet.

During the short period between assuming command of the attacking detachment and the battle of Copenhagen, every moment was utilized in indoctrinating his captains and formulating his plans. The latter, due both to the fact that the position of the enemy's fleet was well known in advance and would probably remain fixed and to the very short time available for indoctrination, were, for Nelson, unusually detailed.

During most of the two years preceding Trafalgar, Nelson was himself commander-in-chief and faithfully followed the same system of training and command inaugurated by him in earlier years. As before, frequent visits to the flagship were made by his captains and these were almost invariably accompanied by talks with the admiral on questions of command, strategy, tactics, and battle.

His confidential secretary during this period wrote: "Even for debating the most important naval business, he preferred a turn on the quarterdeck with his captains, whom he led by his own frankness to express themselves freely, to all the stiffness and formality of a council of war." Another officer serving on the *Victory* at about the same time makes the comment that "when the weather and the service permitted, he very often had several of the admirals and captains to dine with him; who were mostly invited by signal, the rotation of seniority being commonly observed by his Lordship in these invitations."

Speaking of this period, Mahan says: "Upon his own subordinates Nelson laid a distinct charge, that he should expect them to use their judgment and act upon it with independence, sure of his generous construction and support of their action; . . . . he was emphatic in his expression of commendation for action rightly taken; a bare, cold approval was not reward for deeds which he expected to reproduce his own spirit and temper, vivifying the whole of his command, and making his presence virtually co-extensive with its utmost limits. . . . . To deny an officer discretion was as scathing an expression of dissatisfaction as Nelson could utter; and as he sowed, so he reaped, in a devotion and vigor of service few have elicited equally."

Previous to the Battle of Trafalgar, the subordinate commanders were acquainted with the now famous "Memorandum," which has been already referred to in the section on "Loyalty" as the plan which was so clearly understood and so enthusiastically received by all, and which is so remarkable a document that every officer of our own time should study and digest it. In general terms only, it treats of two cases: that of the enemy being to leeward, and that of him being to windward. So general are these considerations that they amount to little more than illustrations for a simple statement of the broad tactical principles and the doctrines, which were to govern the fleet during the prospective battle.

Little else was necessary to ensure the co-ordinated action of subordinates so well prepared as Nelson's were to carry into effect the general intentions of their chief, in spite of the many complex situations sure to occur but impossible clearly to foresee.

Shortly after daylight on the day of Trafalgar signals were made to "Form the order of sailing" (which was specified in the memorandum as the order of battle), to "Prepare for battle," and to "Bear up." This latter signal headed the British squadrons independently on parallel courses so as to intercept the enemy, then about ten miles distant, and conformed to the general plan. The memorandum required that "The whole impression of the British fleet must be to overpower from two or three ships ahead of their commander-in-chief, supposed to be in the center, to the rear of their fleet." This being the broad objective it became at once clear, as the squadrons headed by signal for their opponent, what was in general terms to govern the efforts of each

ship and squadron. The memorandum stated also that "The second in command will, after my intentions are made known to him, have the entire direction of his line to make the attack upon the enemy, and to follow up the blow until they are captured or destroyed." No signals, other than those mentioned above as being sent just after daylight, were made to indicate intentions concerning the movements of the fleet, except one to Collingwood, which ran "I intend to pass through the van of the enemy's line, to prevent him from getting into Cadiz," and another to the fleet on the eve of contact, for "Close action."

It may seem to be an absurd statement that no other than the above tactical signals were necessary between the time of sighting the enemy at daylight and of bringing a fleet of 33 sail into action some six hours later, yet it is true; and the fact that, on leaving the "Victory" just previous to her coming under serious fire, Blackwood and Prowse were instructed by Nelson to board the vessels astern and inform their captains that he depended on their exertions and that if the prescribed plan retarded their getting into action quickly they were to do so in the most practicable manner, does not materially alter the case.

As to the desirability from the point of view of the subordinates of this minimizing of signals when such a "method" is in vogue, an incident related of Collingwood may be instructive. When the flags from the *Victory* began spelling out, "England expects that every man will do his duty," Collingwood impatiently exclaimed," I wish Nelson would stop signalling, as we know well enough what we have to do." As to the same desirability from the point of view of success, the unprecedented results of Trafalgar are sufficiently conclusive.

To indicate Nelson's own conception of the limited function of the commander-in-chief during the approach to, as well as during the progress of battle, the following incident is related: As contact between the two fleets became imminent, and after all signals but that for close action had been made and acknowledged, he said to Blackwood: "Now I can do no more. We must trust to the Great Disposer of all events and to the justice of our cause. I thank God for this great opportunity of doing my duty."

The battle raged for about four hours after the initial clash. During this time but one signal was made by the flagship—that sent by Hardy after Nelson had been wounded, calling a few late

arrivals to the *Victory's* support against several fresh enemy ships which threatened her.

Little more need be said. The unchanging principle of concentrating the whole against a part, *in time,* was irresistible. It was the band of trained, mutually understanding, loyal "brothers" which had done it, after the broad general outline of the manner in which the chief wished the concentration to be done had been made known to them, by the original plan supplemented by a few —a very few—simple signals.

BATTLE PLANS

Nelson was not one to omit an essential link in his chain of elements for victory. No matter how perfect the preparation of ships, admirals and captains, one and all, must have directive force if speedy and effective co-operation of units is to be obtained; that is to say, there must be a plan for the battle and all admirals and captains must be thoroughly acquainted with it. Many naval actions have been lost because there was no concrete plan, good or bad, to furnish continuity and concentration of effort, and by the same token many another battle has been lost because such plans as had been prepared were not brought clearly and properly to the attention of the subordinate commanders.

Not the least of the many merits of Nelson's "method" was the fact that it permitted the formulation of *simple* plans expressed in brief and general terms, which were at the same time entirely intelligible to those who were to execute them, and the fact that it was unnecessary to prescribe more than the movements which were to *initiate* the fight. So much done, Nelson could count with certainty upon his well-educated, well-trained, and uniformly indoctrinated "brothers" to continue and complete the business without further coaching from him, yet nevertheless with concordant effort.

However instructive the fact may be that the "method" contributed to excellence in the formulation and execution of plans, it is important that this should not obscure the point that the *making* of a plan and the *giving out* of the same to all who were to have responsibility for the details of its execution, were essential parts of the method itself.

RÉSUMÉ OF THE METHOD

If what has been said in the foregoing be analyzed, it will become clear that what the writer, for want of a better name, has called Nelson's "method," consisted of a number of separate, yet interdependent, elements, each one of which was essential to the perfection and the success of the whole. These are:

1. *Education.*—Which, in this case, was imparted verbally by the master. It may have been noted by the reader that the manner of *instruction* consisted principally of the stimulation of thought on tactical questions through conference, discussion and argument, in which the frankest expression of ideas by the pupil was encouraged by word and bearing. It was perhaps better suited to the type of pupil that the education took this form, as no doubt they would have considered it ill befitting their rank, age and dignity to have been dogmatized in school-boy fashion. At all events no way of teaching is more effective than that which draws out the pupil to formulate his own ideas after due reflection, and to give expression to them. No learning is acquired well which is not the product of one's own effort.

It may well be imagined that, following Nelson's "talks," his subordinates spent many a quiet hour in the seclusion of their own cabins, pondering and reflecting over what he, and they themselves, had said. Study and reflection are logical, if not indispensable, preludes to decision and action. This truism is as sound today as it was in the year 1798.

It is not to be supposed that these methods failed to be of value to the master himself. While his conceptions and development were much in advance of those of the pupils, the system of instruction nevertheless must have contributed in great measure to the advancement of Nelson himself—genius that he was. An application of this system at the present time would surely be beneficial to any set of captains and to any commander-in-chief.

2. *Training.*—Which in Nelson's time was obtained almost wholly through battle itself. Modern development and conditions have not only made other forms of tactical training possible, but also indeed have rendered them imperatively necessary. Wars come these days with little warning, are accompanied by the employment of a maximum concentrated force almost immediately after their outbreak, and may be frequently decided

by one big naval engagement. The navy, then, which postpones its tactical training until the day of battle will most likely cease on that day to be a navy.

Education without training is inadequate to produce satisfactory results. Practical work is necessary to ripen the fruit of academic work. But it is also true that training alone, without education, cannot produce the desired degree of excellence. The two are complementary, and both, in balanced combination, are necessary to the end of tactical efficiency, and to success in battle.

3. *Indoctrination.*—Which consisted in the imparting of Nelson's own ideas and beliefs, as they developed, to his subordinates in such manner as to carry conviction of their correctness. The process of education was, in effect, itself one of indoctrination both of Nelson and of his subordinates, because indoctrination consists essentially in learning to think alike, that is, to have similar convictions about fundamentals.

The value of doctrine based on universal conviction is, in a military organization, very great. It inspires all with mutual confidence, thus furnishing a moral force of great power; it promotes concentration of purpose and effort and by these means permits unity of action; it is one of the essential requirements preliminary to the proper and effective use of initiative by subordinates; it inspires loyalty to plan; it permits the maximum advantage to be taken of the "time factor"; and it reduces enormously the number and the complexity of orders and of signals necessary to carry a plan into execution.

All of these things have too much influence on the issue of battle to be neglected. While study at the War College is of great value in developing doctrine based on convictions, it can never furnish a complete substitute for the less academic methods possible to be pursued in the active fleet. We can, and most emphatically should, copy Nelson in this particular.

4. *The Inspiration of Loyalty.*—As has been pointed out Nelson was fortunate in possessing a magnetic personalty sufficient to inspire the great personal loyalty which formed the basis of the very essential "plan" loyalty exhibited by his subordinates on all occasions. Yet he fortified this divine gift in many humble ways. He was invariably loyal to those who served under him. He kept them always informed, as far as could properly be done, of news which he had received, of his opinions, general

intentions and plans. A subordinate always likes to know, as a matter of human interest if nothing more, what has happened, what is likely to happen, and the reasons therefor; and his personal loyalty is increased by being taken into the confidence of his chief. There are of course many other means available for stimulating personal loyalty.

Few are born with the magnetism approaching that possessed by Nelson, and few therefore can hope by even the most studied methods, to excite personal loyalty strong enough to alone bring the necessary measure of plan loyalty for assuring properly co-ordinated and united efforts in battle. Perhaps the best means for making certain of the latter is the education of all officers to the point of understanding the prime military necessity for this factor.

Without rigid loyalty to the spirit of the general plan the granting of initiative becomes a grave danger, and united action an impossibility.

5. *The Giving of Initiative.*—But little reflection is required to comprehend the very great danger inherent in the exercise of initiative by subordinate commanders unless they know what they are about, have had their judgment and faculties matured and steadied by training, are imbued with "unanimous concurrence of understanding," and as a body are loyal to the general plan of their chief. These things are necessary before initiative can be safely allowed in battle, and it is the *absolute* necessity that initiative be used, which makes the education, training, indoctrination and loyalizing of subordinate commanders so important.

For many obvious reasons the use of some measure of initiative in action is of great value. But the writer is not content to rest the case here. He maintains that it is *imperatively necessary* to any great success. This is true because of the very vital, ever present and always pressing *time* factor.

If "time" was "everything" in the days of the slow moving sailing ships, how much more is it "everything" in the steam age which has brought such a tremendous increase in the speed of ships. If communication is better facilitated today, it is also true that fleets are larger, that types of ships and weapons have multiplied, and in consequence, that the complexities of battle, and the difficulties of giving individual direction to subordinates *in*

time have increased. In the modern naval action between large fleets no single eye will be able to take in the whole field, the great ranges will introduce much parallax into the observations of any single person, the relative positions of the forces will be changing momentarily, and the difficulties of prompt radio communication due to interference, as well as the inadequacy of flag signalling due to distance, will be pronounced. Under these circumstances, to expect a subordinate commander to postpone an obviously desirable movement until he receives orders to do so, or until he has acquainted the commander-in-chief with the situation and obtained in reply permission to do so, would seem to be the height of folly and the forerunner of defeat. Such a course would be criminally wasteful of opportunities; every movement would be *too late*.

At the risk of tedious repetition, let me say again for the sake of greater emphasis, that the proper use of initiative is vitally necessary; and that initiative not only cannot be used properly, but will be attended by grave risks, unless the men entrusted with it have been previously educated, trained, indoctrinated and loyalized.

6. *The Formulation and Dissemination of Plan.*—The foregoing closely related elements being accepted, each in its own sphere, as essential parts of the "method," it will become apparent that still another was an integral part thereof. A focus to the effort of the separated units of the fleet was necessary, and was supplied by the formulation of a general plan of action and by thoroughly acquainting all with its substance. Nelson's plans, particularly that for Trafalgar, were models for completeness, without unduly specifying details. The "system" took all the care of the details that was necessary, after the subordinate commanders had been acquainted with the general wishes and intentions of the commander-in-chief. The junior admirals and the captains, each within his own province, added to or modified the general orders, from time to time, to suit the conditions of his own command, in such manner as would best further the attainment of the principal objective, which, in the case of Trafalgar, for example, was to crush the enemy's rear before it could be supported by his van.

At the Nile there was no opportunity to discuss the situation with his subordinates, yet a few simple signals conveyed the

general plan to them. Of this Mahan says: "It was, therefore, no fortuitous coincidence that the battle was fought on a plan preconcerted in general outline, though necessarily subject to particular variations in detail. Not only had many situations been discussed, as Berry tells us, but new signals had been inserted in the signal book to enable the admiral's intentions to be quickly understood."

The plan once promulgated, and fortified by the preceding elements, the commander-in-chief of a large fleet, besides stimulating morale, can do little more to shape the action.

7. *The Stimulation of Morale.*—The accomplishment of each of the above six elements, is in itself a means for elevating the moral force of the personnel. When all of them in combination have been effected, universal confidence and combative ardor have been assured. No one knew this better than Nelson, yet he took pains on more than one occasion to raise the "fighting edge" to the highest pitch, the famous signal during the approach at Trafalgar being the best example, and the "method" cannot be considered as complete without a due recognition of this final element.

CONCLUSION

Nelson's tactics were in the main conspicuously sound. While exception may be taken by some to isolated instances of tactical mistakes, these were usually justified by the special conditions of the case and merely emphasize the fact that in practice something more than knowledge of the letter of tactical rules and principles is required. One must be able to differentiate between the occasion demanding rigid adherence to accepted form and that requiring radical treatment.

There is a time-honored dispute as to the exact manner in which Nelson led his squadron into battle at Trafalgar, but, even granting the worst that can be said about him in this respect, he deliberately and knowingly led the force under his immediate command into a bad situation in order to accomplish more surely a greater object—that of concentrating the *whole* fleet on the enemy's rear *in time—before* it could receive friendly support.

Few will dispute that tactical genius shone in most of his deeds on the field of battle, nor that even greater tactical genius was displayed in his plans for battle, but the writer hopes that enough

has been said to show that Nelson's greatest claim to fame lay in his ability to *prepare* a fleet for battle, rather than in his skill in its conduct during battle or in formulating tactical plans therefor.

The "method" which he evolved was unique, and, when in proper working order, gave to the fleet the functions of an automatic machine, wherein, the broad plan alone being specified, there followed that type of co-ordinated effort which multiplied many fold the strength of the fleet as compared to what was possible to effect through the detailed consecutive direction of the commander-in-chief alone.

Every one of the elements of this method, every link of the chain, had to be present in full strength, in order that the whole might work with success. Each required patient and persistent effort to be developed to the required extent. This wonderful man was not deterred from the task on this account, but, not satisfied with the accepted measure of success, set about it to give "victory" a definition beyond previous aspirations.

His conceptions of the end to be attained have been bequeathed to us, but not so his means. In some strange fashion those who served with him, and those naval men who followed after them, failed to appreciate both the "method" in its entirety and the relative importance of its constituent elements. Most admirals of the Nelson era and those who followed it, prepared their fleets for action as we are doing now, and handled them before and during battle as we would probably do now.

It is hoped that the way has been pointed for us towards a far higher degree of efficiency in battle than is possible by present methods. Now, as in 1805, the die is cast when action is joined. It is too late then for specific detailed directions.

In closing I can do no better than to quote, from the great admiral himself, the introduction to his "Plan of Attack," issued in May, 1805. It indicates how great is the strength to be derived from a proper system of command and shows his conception of the part which, after the "method" has been developed, a commander-in-chief should, and can with profit, play before and during battle.

"The business of an English commander-in-chief being first to bring an enemy's fleet to battle, on the most advantageous terms to himself (I mean that of laying his ship close on board

the enemy, as expeditiously as possible), and secondly to continue them there without separating, until the business is decided; I am sensible beyond this object it is not necessary that I should say a word, being fully assured that the admirals and captains of the fleet I have the honor to command will, knowing my precise object, that of a close and decisive battle, supply any deficiency in my not making signals; which may, if extended beyond these objects, either be misunderstood, or if waited for, very probably, from various causes, be impossible for the commander-in-chief to make; therefore, it will only be requisite for me to state, in as few words as possible, the various modes in which it may be necessary for me to obtain my object . . . . ."

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Honorable Mention, 1914

NAVAL POLICY

AS IT RELATES TO THE SHORE ESTABLISHMENT, AND THE MAINTENANCE OF THE FLEET

By CAPTAIN JOHN HOOD, U. S. Navy

Motto: The interests of the Nation predominate all others

As the nation has grown the navy has grown until the naval appropriations made for the present fiscal year exceed one hundred and forty millions of dollars; and yet, with this large sum, the greatest peace appropriation for naval purposes in our history, only one ship of the first line was provided for.

During the past summer, in estimating and apportioning the resources of the country under the new tariff law, Senator Simmons for the Senate, in a tentative allotment of funds, allotted one hundred and forty-five millions of dollars to the navy, and Representative Underwood of the House one hundred and forty-eight millions for the coming fiscal year. These sums are enormous and only a very few years ago would have appalled all the people of the country. Even at the present day they stagger many thinking men; and there is a not inconsiderable, and possibly growing, number of people throughout the country asking, Why this great expenditure? and, Is the nation getting a fair return for the money expended?

With such an expenditure as authorized for the present fiscal year, and only one capital ship added to the fleet, it is difficult to frame answers to these questions which will satisfy reasonable men. That naval expenses increase as the navy increases with the growth of the nation is axiomatic. But, does the sea power of the nation, as represented by the fleet, increase proportionately with the growth of the nation and with the money appropriated? That is a question that may well come to any thinking man when

he considers the aggregate of the appropriations for the past two years in connection with the fact that for each of these years only one battleship was added to the fleet. This question will come with even stronger force should either of the sums mentioned above as tentatively allotted be appropriated for naval purposes during the present session of Congress, and again only one battleship be provided for.

While nothing, created and managed by human agency can be made absolutely perfect, the writer of this essay believes that great improvements can be made in existing conditions, and the nation given a fairer return in sea power for the money expended, by changes in methods of legislation that are practicable, and by following a systematic policy of expenditure for the money appropriated.

There are, at the present time, approximately ninety-three millions of dollars per annum of the total naval appropriation that may be called a fixed charge, and this is increasing from year to year. The expenditure of this, while supporting the navy in its present state, does not maintain or add to the sea power of the nation. If by any system or policy any portion of these fixed charges can be diverted to the improvement or increase of the fleet, a great gain will have been attained; and there is no subject that should be of greater interest, not only to the navy itself, but to every lover of the navy and to every taxpayer of the country, than any system or policy that will tend to reduce fixed charges for the benefit of the fleet, and so to attain the greatest sea power possible within the limits of the available funds.

Originality for all that will be advanced here is not claimed. The arguments and reasons given are the fruits of many years of study and thought, and of many discussions and interchanges of views with leading officers of the navy and others having the best interests of the nation and of the navy at heart.

GENERAL REMARKS

Up to the present time it cannot be said that any *policy* has governed the growth and development of our shore establishment to the state in which it exists today. Beginning with the sail period, when the country was sparsely settled and struggling for its existence, when land communication was of the crudest and most difficult, and land transportation for bulky and heavy

freight impracticable, and manufacturing in its infancy, navy yards were first established to meet the conditions of the day, where populations were more centered and material more available and convenient. As the country has grown and expanded other stations have been added to the establishment by the same natural laws, assisted by the local desires of different communities to have large government plants established within their limits, with the consequent large expenditures of government money among the people of those communities.

Once established, continuation of existing shore stations has been along the line of least resistance. Yards which may have been valuable fifty or a hundred years ago may be valueless now with the changed conditions both in ship construction and in ship capabilities. Where in a given area fifty or a hundred years ago lack of transportation and facilities may have required two or more stations, one may suffice now. Where the crude needs of a century ago may have planted a station to meet a local and restricted condition, that station may be so situated as to be useless for the greater needs of the great fleets of today with their wider range of action. Yet, however useless for the maintenance of the fleet an already established yard may have proved, there is a natural hesitation on the part of the government to abandon a plant representing large previous expenditures; and there is, invariably an equally natural strong opposition to such abandonment on the part of the local communities surrounding the plant, whose viewpoint is colored both by self-interest and by local as opposed to national interests.

The various shore stations, thus, have come into being to meet the needs of the moment, as expediency or sectional interest dictated, and not in accordance with any comprehensive well-digested plan following a *policy* looking to the best good of the whole nation.

Lacking such a policy, the naval shore establishment of today presents, as a whole, the aspect of a makeshift, an attempt to meet present-day requirements with a plant established under entirely different circumstances, and, like all makeshifts, conduces to waste of public funds, and fails to ensure that maximum preparedness for war which the people as a whole have a right to demand.

All this has been a natural evolution, and must be one of the

great elements to be taken into consideration in the formulation of any policy for the guidance of the future. The establishment as it exists today is the groundwork on which we must build, and no immediate and abrupt change is either possible or probable. But our best thought and endeavor should be given to the problem of evolving from what we now have, and being always guided by the fundamental underlying *principles* involved, a policy for guidance hereafter which will eventually give to the nation all they have a right to expect—the maximum of effective sea power for the moneys appropriated for naval purposes.

GENERAL PRINCIPLES

The branch of naval policy here under consideration covers the entire shore establishment, from the central administration in the Navy Department to the farthest base or naval station. Any intelligent conception or discussion of it should be founded on the basic principle *that the entire shore establishment exists solely for, and is an adjunct to,* the fleet. It is on this conception that all the following discussion is based.

The sea power of a nation is measured by two elements: first, the strength and power of its fleet; second, the ability of the nation to *maintain* this fleet in the theater of operations in a condition of readiness to use its strength and deliver its power. The first of these—the primary element—is not the subject of this paper. It is to deal with the second that this is written, and endeavor will be made to outline a policy which will lead to a maximum of maintenance ability, as necessary for effective war as the existence of the fleet, at a minimum of cost to the people.

The desire of the people for an *adequate* navy, as expressed in the platforms of all political parties, leaves no doubt as to their attitude. Congress will always respond to the wishes of the people and provide the necessary appropriations, *when they can see and know that the appropriations are producing the result desired.* The producing of this result—an adequate navy—at a reasonable cost necessitates the using of the appropriations provided in such a way as to produce the greatest sea power that can be obtained within that limit of cost. The basic principle enunciated above—the subordination of the shore establishment to the fleet—gives the rule by which Congress should be guided in apportioning moneys in drawing the naval appropriation bills, and the depart-

ment in disbursing those moneys, viz.: *with a given and sufficient appropriation for all naval purposes, to obtain the greatest sea power, the maximum amount of the appropriation possible should be put into the construction of the greatest fleet that can be maintained with the remainder.*

This requires, for the production of the maximum sea power at a given cost, the reduction of this *remainder* to the minimum consistent with efficient maintenance; and this entails the greatest efficiency and the greatest economy on the maintenance side of the navy, or in the shore establishment. For, if the money of the people be wisely appropriated with the object of obtaining the greatest sea power attainable with the amount appropriated, and the appropriation bills be so drawn that the money can be used to the best advantage, then every dollar uselessly expended on shore is just so much deducted from the funds available for the increase of the fleet, and by that much curtails the nation's sea power.

Efficiency and economy flow from good organization and administration, combined with concentration of effort and the elimination of all useless parts; and it is a recognized principle in business organization that diffusion of effort and unnecessary duplication and extension of plants are uneconomic and wasteful.

The logical conclusion from the foregoing may be summed up in the statement that good policy demands business organization and concentration of effort; or, as applied to the navy, *good policy, from the economic point of view, demands that the shore establishment of the navy shall consist of the fewest number of highly organized elements possible and consistent with the efficient maintenance of the fleet.*

This—which we may call the economic principle—provides us with one of the fundamental principles on which our naval policy should be based.

To arrive at the next requires an extensive knowledge of history and strategy, and a careful and exhaustive study of our own national policies and aspirations—both political and commercial—and of the policies and aspirations of other nations whose interests run parallel to or conflict with ours. To this must be added exhaustive geographic studies, from a strategic point of view, covering all the approaches to our own coasts and to our outlying possessions, and all foreign possessions from which those

approaches may be threatened. Years of thought and study along these lines have convinced the writer that for the protection of our outlying possessions, of our natural trade routes, and of our own continental coasts themselves, our interests—and, in the case of a war with a nation possessing a strong navy, even our self-preservation—require that we possess a navy sufficiently strong to dominate the Western North Atlantic (including the Caribbean Sea and the Gulf of Mexico) and the Northern Pacific. The word "dominate," as here used, means the having and being able to *maintain* in the areas to be dominated a superiority of force over any force that is likely to be brought against it. Any less force than this is inadequate and effort largely wasted, since it leaves our detached possessions, Porto Rico, the Panama Canal, Alaska, Hawaii, Guam and the Philippines, open to capture, our foreign trade to destruction and our own coasts to direct attack.

From this follows the second fundamental principle—which we may call the strategic principle—that should govern our naval policy; and, as applied to the shore establishment, may be expressed in the words: *Our naval bases and arsenals should be sufficient in number to maintain the fleet in war, and so located as to insure us naval supremacy in the Western North Atlantic (including the Caribbean Sea and the Gulf of Mexico) and in the Northern Pacific.*

DEFINITIONS

The two fundamental principles enunciated above, the strategic and the economic, combined with the groundwork furnished by the existing shore establishment, provide all the elements necessary for the deduction of a national naval policy; but before proceeding with the development of the details of the policy which flow from them, a number of definitions will be given, in order to clarify the discussion and avoid the confusion that has so often existed in previous discussions from a misapplication of names and a confusion of terms.

A *naval base* is, generically, a place from which a fleet can operate and be maintained. Its requisites for the right performance of its functions are: Position, strength, resources.

A naval base may be of two kinds, one a fixed or *permanent base;* the other a movable or *advanced base.* With the latter

this discussion has no concern, since such bases are temporary in character, and their number, location and strength are questions of the immediate strategy and tactics of the campaign producing them, and not questions of national naval policy.

Permanent naval bases are the fixed naval bases of the country, and their numbers, locations and character are questions of national policy and grand strategy; and in fixing these numbers, locations and character the principles of this policy and strategy should be followed, to the end that these bases will meet every need of the fleet in war for as far into the future as can be humanly foreseen.

Permanent naval bases may be of three classes: *Home bases, outlying bases* and *subsidiary bases.*

A *home base* is a base within the continental territory of the country from which the fleet can effectively operate and be maintained, supplied and upkept at all times in peace and war. The base, in this sense, is a region rather than a spot. Its necessary elements are a harbor of sufficient size, an ample population in the immediate vicinity of the harbor for a labor supply, a navy yard or arsenal with docks, shops, etc., on the harbor for repair and upkeep, a surrounding contributing territory with efficient communications for general supply, and all of these behind adequate fixed defences independent of the fleet. Neither the harbor, the population or city, the navy yard or arsenal, the most ample supplies nor the most adequate defences, alone, or in any combination, except the combination of them all, constitute a *home base.* They are each and all necessary elements of such a base; and with any of them lacking the base is incomplete, for the fleet cannot freely operate from it, but will be hampered, delayed or tied to the defense of its base, and not free to perform its true function—the gaining and controlling the mastery of the sea.

An outlying base is a permanent naval arsenal without the continental limits of the country on an outlying possession, and should be designed to be an impregnable point of support from which the fleet can operate in war, and from which it can be subsisted for limited periods in war. Its elements differ from those of a home base in degree rather than kind. Its harborage, supply of both labor and material, and repair and upkeep facilities may be less, but its defences should be equal or greater.

A subsidiary base is a base that contains all the elements of a

home base in lesser degrees, and which, while not capable of supporting the fleet, may support lesser elements or portions of it.

A navy yard, or *arsenal,* is a docking, repair and supply station for the fleet. It is always a necessary element of any permanent naval base, but neither does nor can, of itself, constitute a naval base in any sense, though so generally confused with one.

A fortified port is a port whose approaches are guarded. It may or may not contain repair facilities. Within such ports ships may take refuge, or from them minor operations may be launched in war. Unless they contain *all* the elements, they are in no sense naval bases, though, like navy yards, they are often spoken of as such.

The above definitions have been given at some length in order to emphasize and bring out strongly the absolutely necessary requisites of *naval bases* as distinguished from navy yards and fortified ports, with which they are so loosely and so generally confounded in the public mind, and sometimes even in the professional mind.

THE AIM OF POLICY

The ideal of a shore establishment would be a central administration, or Navy Department, *organized for war,* with an efficient naval (military) staff, and with its material, offices and divisions organized for administration and supply as in war; a system of schools and stations for the education and training of officers and men and for scientific naval experiment; and a system of bases, *home, outlying* and *subsidiary,* sufficient in number to fully maintain the fleet, and so located as to give the fleet control over the areas required by our national interests, and only this number.

Such an establishment represents the goal towards which we should strive and towards which our policy should be shaped. The attainment of that part of the aim, however, which relates to the organization of the Navy Department and the interior administration and conduct of business in the offices of the department, in the schools and in the bases themselves, are questions of administrative reform rather than of policy, and will not be dealt with here. But the questions of the number, location and character of bases are questions of pure policy and strategy, and will be treated in order at some length.

HOME BASES

As stated before, the groundwork from which we must build is what we already have. As defined, we have now no completely developed *home bases*. We have navy yards or naval stations at Portsmouth, N. H., Boston, New York, Philadelphia, Norfolk, Charleston, S. C., Key West, Pensacola, and New Orleans on the East Coast and Gulf, and at Mare Island and Bremerton on the West Coast. Starting with these as a foundation, and with the two fundamental principles already deduced as guides—the "economic," or principle of means, and the "strategic," or principle of objective—how many and where should our home bases be?

The principle of economy calls for the establishment of the least number of home bases that will maintain the fleet. If this principle alone could be considered, and the strategic principle ignored, *one* great *home base* centrally located and fully developed on the East Coast, and one on the West Coast could maintain the fleet in time of peace at less cost than any greater number. The strategic principle cannot be ignored, however, for the fleet must be maintained and be free to act both in peace and war; and with our long coast line on both oceans, distances of action would be unduly great with only one base; and should this single base be blocked, contained, or suffer injury in any way during war, all operations on that coast would be paralyzed. Further, disaster to the fleet, or portions of it, is possible, and true strategy provides always more than one line of retreat when it is possible to do so. Therefore, the strategic principle imperatively demands at least more than one *home base* on each coast, and that they should be *sufficient* in number to maintain the fleet at all times, in peace and war.

In reconciling the opposing interests of the two principles, three elements must be taken into the maturest consideration and carefully weighed: the national safety; the efficient maintenance of the fleet, and economy of means. The first must be absolute, and is insured by the second, which must be secured within the limits of the third. Considering the great cost of a properly developed home base, and the means that will be available for their establishment within a cost allowed by the revenues of the country, the reconciling statement may be expressed in the words, *the number of home bases should be the smallest compatible with the insurance of the national safety and the efficient maintenance of the fleet in war.*

In the opinion of the writer all the conditions of the problem can be met by *two* properly located and developed *home bases* on each coast; and he believes that more than two such bases are not needed on either coast by the application of the strategic principle, and that their extension beyond this number is directly contrary to the economic principle and would lead only to extravagance and waste, and a consequent reduction in the sea power of the nation. As will be seen later, this does not preclude the establishment of certain permanent *subsidiary bases,* nor the present use of existing navy yards. The development of the home bases will be an evolution that will extend over a considerable period of years, and the needs of the fleet will call for the use of all existing facilities during that period.

The locations for the four *home bases* called for by this policy have been long a subject of grave consideration and study. Strategy requires that they shall be located to give naval control over the Western North Atlantic and the Northern Pacific. Economy requires that they shall be located in centers of supply and industry. Natural conditions require that they shall have ample harborage, and be provided with adequate independent defence. All may be summed up in the three requisites: Position, strength, resources.

In weighing the advantages and disadvantages of locations for home bases, these being the great maintaining and supply bases of the fleet, given "position" sufficiently favorable to accomplish the strategic result of control, and natural or supplied "strength" for effective defence, "resources" should be the determining factor in selecting location.

On the East Coast, nature in providing the great estuary of the Chesapeake, and no other estuary or harbor south of it equal to the demands for harborage of a home base, has fixed the location of the southernmost base. This location is not ideal, and strategy would be better served if the base were farther to the southward. Its "position," however, is sufficient to fulfill the requirements of strategy; and the natural laws of trade have centered on the Chesapeake all the "resources" of the Middle and near Southern states; and it is the distributing point of the great steaming coal fields of the country. Its present defended anchorage is large and ample, and, on the completion of the projected fortifications on Cape Henry and the Middle Ground, will

extend over the entire bay and its tributaries. It already possesses considerable of the needed docking and repair plant in the Norfolk Navy Yard and the Newport News Shipbuilding plant; and to those facilities the plant of the Maryland Steel Company can be added with the completed defence of the mouth of the bay.

With all these advantages, possessed by no other location on the coast to the southward,—for besides lack of harborage, at no other place has trade centered the needed "resources,"—the lower Chesapeake must, perforce, be the location of the southernmost home base on the East Coast.

In selecting the location for the northern base on the East Coast there has been, and still is, some considerable divergence of opinion among experts as to the best location. We have navy yards at Portsmouth, N. H., Boston and New York, and a naval station on Narragansett Bay. These are all included in what may be called the northern base "region," which would include the New England states, New York, New Jersey, Pennsylvania and the near Lake states, all of whose "resources" would be contributory to the northern base. Of the places in this region where we have already naval establishments, Boston, Narragansett Bay and New York have all had their advocates as the right location for the base, especially Narragansett Bay and New York.

Considered from a strategic point of view, there is little to choose from between the three sites as far as "position" is concerned. In point of "strength," they can all be made secure, though New York is very considerably stronger than either Boston or Narragansett Bay, both by nature and by supplied defences.

When we come to the question of "resources," however, which should be the deciding element for a *home base,* even at some expense to the other two elements if necessary—which is *not* the case so far as these three places are concerned—all comparison ceases.

Boston, which means all behind its defences, has some very considerable resources in its large industrial population, its large trade, its extensive and efficient means of communication, and its existing navy yard for a docking and repair plant. To this latter may be later added a dock and repair plant proposed by the Commonwealth of Massachusetts. Its harborage, however, is, and must always be, totally inadequate to the needs of a *home base;* and this alone, though other advantages were equal,

would preclude it forever from selection as a *home base* under any well-digested plan of naval development.

Narragansett Bay, which has had many and ardent advocates as the proper location of the northern base, should, to the mind of the writer, be placed without the pale of discussion when the question of "resources" is under consideration. The natural laws of trade have side-tracked it in the field of commerce. On land its only seaport is approached by one single-track railroad. Its sea approaches can be easily blocked. Its surroundings that could be used for naval base purposes are without supply of either labor or material needed for those purposes. There is nothing existent in the way of docking and repair facilities. Considered, therefore, from the point of view of existing circumstances, its "resources" may be said to be nil. To establish a *home base* there would mean the supplying artificially, at a cost not to be calculated, all the "resources" needed for such a base, which natural laws have already so liberally supplied elsewhere, and the performing of this Herculean feat in the face of the opposition of all the natural and settled laws of trade that have grown up with the country. For it can be safely stated that no amount of expenditure of government money about Narragansett Bay will divert trade with its concomitants—the centering of supplies of labor and material—from Boston on one side or New York on the other.

Incidentally it may be stated that the magnificent expanse of anchorage in Narragansett Bay has been somewhat exaggerated, and that "the great advantage of two entrances" is a myth. The bay is large, but the area available for deep draft ships is restricted; and the so-called second entrance can only be used by ships of lighter draft, and is of no especial advantage for them, since both entrances debouch on the ocean together.

One inherent advantage Narragansett Bay does possess—a natural deep water entrance. Neither Boston nor New York are provided with such an entrance by nature; but the needs of commerce at those two great centers of trade will always provide channels adequate to all naval needs.

All things considered the lack of natural "resources," and the prohibitive cost of supplying those necessary for a *home base* artificially, should eliminate Narragansett Bay from consideration as such a base. Its legitimate use in naval warfare will be discussed later.

There is left for consideration New York, whose incomparably greater "resources" it is that causes a cessation of comparison with any other place on the coast when discussing the question of selection of a site for a *home base* from the point of view of "resources." Natural laws have centered there greater "resources" than at any other place in the country. It is the trade center of the eastern littoral, with incomparable means of communication, and is the greatest reservoir of supply, both of labor and material, that we possess. In addition it possesses an efficient —though badly located and inadequate—docking and repair plant, and unlimited anchorage. For the anchorage of a New York base extends from the fortifications at Sandy Hook, through the sound to the fortifications of the eastern approaches on Fisher's, Plum and Gull islands, including lower and upper New York bays, the Hudson River and Long Island Sound to the Race. It already possesses two entrances more than a hundred miles apart for vessels of moderate size, and, with improvements at Hell Gate, can be made to possess them for vessels of any size. Its reservoir of labor supply in the millions grouped about the lower Hudson, whether in New York or New Jersey, and its reservoir of material supply is the greatest existing on the continent. Its one weakness, from the point of view of "resources," is its badly located, restricted and inadequate docking and repair plant; but even in this weak point it is superior to all other locations that have been considered in this region. It would, however, be the part of wisdom to select another site below bridges, and not requiring the navigation of the East River to approach, preferably on the Jersey side, and begin the establishment of a new docking and repair plant, meantime making full use of the navy yard we already have; and, in the opinion of the writer, this should be started at the earliest date practicable.

From all of the foregoing discussion it seems clear that, in "position," New York is at least equal to any point in this region where the establishment of a *home base* is practicable; in "strength" it is greater; in "resources" it is so much greater as to silence comparison. Hence, logically, and in accordance with the fundamental principles of good policy, New York—meaning, as stated above, all that lies behind the defences of both approaches—should be the location of our northern *home base.*

In this connection attention is invited to the following quotation from Mahan's Naval Strategy, 1911, pages 169-170:

> Chesapeake Bay and New York on our Atlantic Coast are two ports clearly indicated by nature as primary bases of supply, and consequently for arsenals of chief importance. For these reasons, they are also the proper ports of retreat in case of a bad defeat, because of the resources that should be accumulated in them. . . . . Other ports on the same coast, Boston, Philadelphia, Charleston and others may serve for momentary utility, disseminating provisions and preparations. . . . . *Economy of means and of money forbid the multiplication of maritime fortresses beyond the strictly necessary.* (The italics in the last sentence are the writer's.)

On the West Coast, there is neither choice nor room for argument as to the proper location of the home bases for that coast. Nature itself has provided two, and only two, locations for such bases, well situated for such purposes, in providing the two great estuaries of Puget Sound and San Francisco Bay and *no* others of sufficient space. The natural laws of trade have centered on these two estuaries the "resources" of the western country; they are of great natural defensive strength and have ample harborage for the fleet. So, in them, we have combined in a greater degree than anywhere else on the West Coast the three requisites, position, strength, resources, needed for home bases. They are both lacking in the ship docking and repair element of "resources," since the navy yard at Bremerton is not yet fully developed to meet all the demands of the fleet, and the navy yard at Mare Island is, from its location, incapable of such development except at a prohibitive and continuing cost. At Puget Sound the resources in this element are increased by the presence of the Seattle Construction and Drydock Company's plant, and lesser plants at Seattle, and are greater than would be shown by the naval plant alone; and at San Francisco Bay by the Union Iron Works and some lesser plants. It would be the part of wisdom, however, to have at each base a fully developed *naval* plant, and for this reason facilities at Bremerton should be increased, and a new station developed in lower San Francisco Bay on deep water.

In speaking of the development of the four home bases herein recommended—at New York, the lower Chesapeake, Puget Sound and San Francisco Bay—it is not intended that the idea is to be conveyed that these four bases are to spring at once into full being, as Minerva from the head of Jove, and that all other

plants and stations are to be immediately abandoned. Their full development must, of necessity, be a growth of years, during which period the fleet must be maintained and kept prepared for war with what plant we now have. But the policy should be, in the using of funds for the shore establishment, to use all funds available for *development* on these *bases,* and only such as are absolutely necessary for *maintenance* on other stations for as long as their use may be necessary, with an ultimate view of discontinuing all stations not serving as bases of various kinds, and not needed for the maintenance of the fleet in war.

SUBSIDIARY BASES

These, like home bases, should be reduced to the minimum consistent with preparedness for war. Theoretically, there should be none; but there are certain naval activities, like the care and preservation of ships in reserve, the care and preparation of the auxiliary fleet, the manufacture and preparation of certain naval supplies and equipment, the fitting out of oversea landing operations, which may be better and more economically performed elsewhere than at the home bases. There may be other places possessing peculiar strategic advantages of their own where the establishment of a home base is neither desirable nor practicable, but whose occupation for particular purposes would be vital in war.

Philadelphia, situated well in the interior, and thus perfectly secure from sea attack, in the center of the largest shipbuilding interests of the country, and of other great manufacturing interests, and with resources of labor and material second only to New York, is most happily located for naval manufacturing or building purposes; and with its fresh water harbor added to its other advantages, it becomes an almost ideal place as a home for ships in reserve and for the fleet of auxiliaries. Further, its security, and the space owned there by the government, capable of almost unlimited development, together with the ample supply afforded by the Philadelphia markets, make it a particularly suitable place for organizing advanced base outfits, or fitting out any large oversea landing operations.

As a *home base,* its lack of strategic "position," and its distance from the sea up a long narrow channel, puts it out of consideration. But as a *subsidiary base,* for the purposes indicated above, no place could have been better designed by nature

or have been given greater natural facilities. Therefore, in the opinion of the writer, Philadelphia should be always retained as our leading *subsidiary base,* and the navy yard there developed along the lines indicated as a building and manufacturing yard, and as a home station for the reserve fleet and auxiliaries and the advance base outfit.

Key West, from its position on the Florida Straits, guarding the entrances to the Gulf of Mexico, and as the most advanced post of our Eastern littoral towards the Caribbean and Gulf, occupies a permanent strategic position for torpedo warfare, and will later in air warfare, when that branch of the service has been developed. Further, it occupies a position of great strategic importance relative to the Caribbean base that will be discussed later.

Physical conditions prohibit the establishment of a *home base* there, even if one was needed—which it is not; but as a *subsidiary base* for torpedo warfare, with later aerial additions, its "position" could hardly be better; and the present naval station there should be always retained for that purpose, and developed along those lines.

The writer of this essay, after many years of thought on and study of naval history, warfare and strategy, can see no need for any more *bases* along our continental coast lines, either *home* or *subsidiary,* for the successful prosecution of war and the efficient maintenance of the fleet than the four *home* and two *subsidiary* bases indicated in the foregoing discussion, when they shall have been developed; and he believes that the maintenance of any more after that period will lead only to extravagance and waste, and the reduction of the sea power of the nation. The uses of the other branches of the present naval establishment within the continental limits of the country will be discussed later under another head.

OUTLYING BASES

From Eastport, Me., to Colon, via the Windward Passage is 2493 miles; from Nome, Alaska, to Panama is 5970 miles; from Porto Rico to Manila, via the Panama Canal, Hawaii and Guam, is 10,546 miles; our continental Alantic Coast extends over approximately 1600 miles, and our continental Pacific Coast, excluding Alaska, extends over about 1200 miles.

If our national interests and indeed our self-preservation demand, as the writer of this paper firmly believes they do, that we should in war maintain naval supremacy over the Western North Atlantic and the Northern Pacific, then policy demands that we should establish in those areas a series of *outlying bases* sufficient in number and so located as to insure us that supremacy, since, as shown in the paragraph immediately preceding, distances are too great for the fleet to operate effectively from the *home bases* alone over those areas.

The same principles of economy and strategy hold in the establishment of outlying bases that apply to home bases, viz.: that there should be the least number of them compatible with the object to be accomplished—the naval control of the Western North Atlantic and Northern Pacific—and that they should be so located as to give this control.

The most probable, and almost certain, naval theater of action in any war that we may have with a European nation will be in the Caribbean Sea or waters adjacent thereto, since it is there we are weakest and most vulnerable, with our present long undefended line of communications from Hatteras via the Windward and other passages to the Panama Canal. It would be a bold nation that would make a direct frontal attack on our Atlantic seaboard, where we are strongest, and whose adjacent waters are within the radius of our *home bases,* unless our fleet had been annihilated or driven from the ocean. We must, therefore, for the national safety, secure this weak flank extending through Porto Rico and the Panama Canal, and via which the way to attack is opened to the Gulf ports. With the effective radius of action of fleets, there is one and only one way to attain this security, viz.: to establish a strong and secure *outlying base* in the Caribbean Sea, covering the line of our own communications, and on the line of approach of any possible enemy.

While Samana Bay, at the eastern end of Santo Domingo, with its capacious harbor, and the ease with which its entrance could be defended, would offer probably the best position of any in the West Indies for an outlying base, it is unfortunately not in our possession; and we must look to our own possessions for a base. It was for the purpose of establishing such a base that we acquired Guantanamo Bay at the close of the Spanish War; and, after Samana, this fine harbor offers the next best position; and is,

indeed, in some respects superior, being more directly on our lines of communication, and more easily supplied and re-enforced, since with the completion of the Florida East Coast Railway, and of the railway from Santiago, Cuba, to Guantanamo Bay, there is direct railway communication to it from our own centers, except for a short sea passage from Key West to Havana, well behind the line of defence.

The " position " of Guantanamo is excellent, though not ideal; it is capable of being given the needed " strength " at a reasonable cost, and its " resources " can be supplied and maintained better and at less cost than can those of any other Caribbean site. Further, we have already expended considerable sums there, and begun its development; and this development of it into a proper *outlying base* of the requisite strength and resources cannot be proceeded with too soon for the good of the national defence.

The Isthmus of Panama constitutes the next link in our line of defence and communication. Happily, here, where an *outlying base* is so much needed, the navy finds one already established to its hand, by the wise foresight of the government and of the Canal Commission, and will be burdened only with the care of keeping certain distinctly naval supplies on hand. The " position " is there by nature, and the requisite " strength " and general " resources " have already been provided for.

With Guantanamo and the Isthmus secure, the Western North Atlantic (including the Gulf and Caribbean) is provided for, since these, with the *home bases,* will fully cover the whole area to be dominated, and the establishment of any further bases on this side would only be waste of money and effort.

With war in the Pacific, our operations would have to extend to the coast of Asia itself, and to do so we must be able to take the fleet across the whole broad expanse of the Pacific and maintain it there. To operate effectively across this distance requires at least two secure points of support. Nature has placed on this line two points of peculiarly strong strategic position, Hawaii and Guam, one with reference to America, and the other with reference to Asia. The holder of the Hawaiian Islands commands every line of approach to our West Coast from Alaska to Panama. The holder of Guam commands every line of approach to the Asiatic Coast, including Japan and the Philippines, even better, since distances are shorter. Those two stations are in

supporting distance of each other, and Hawaii is in supporting distance of our West Coast, and the two together form the necessary links to span and control the Pacific. Happily, they are both in our possession, and only need development as outlying bases to insure us supremacy in the Northern Pacific. The value of the Hawaiian Islands as an outlying base has been already recognized, and provision is being made for its development. That Guam, of even more strategic value in a war with an Asiatic nation, or with any enemy coming from Asia, and so necessary to our control of the Pacific, has not been more fully recognized seems almost incredible. Its value is better set forth in the words of Admiral Mahan than can be done by my pen. In a letter written by the great strategist in July of 1910, he says:

> . . . . and I think no one can believe that the United States is willing, or if willing, would find it cheaper, to protect the Pacific coast by land force than by a superior fleet based ultimately upon Pearl Harbor and secondarily based on Guam. Guam securely held, with a navy superior to Japan, threatens every Japanese interest from Dalny and Corea to Nagasaki and Yokohama.
>
> . . . . But a caution is needed. Neither strength nor resources should be accumulated there, unless the whole is made so strong that it cannot easily be reduced. If Guam must fall to a surprise, or to a seige, better it should fall a bare situation, than provided with works and armament and supplies available for such a land force. . . . . Let us not by half measures contribute to her greater success. Advanced national outposts, like Malta and Gibraltar, must be Maltas and Gibraltars.
>
> In brief, granting a superior American fleet, which I believe now exists, it is my opinion that the Philippines can be more securely maintained by the secure establishment of Guam as an advanced base than by local tenure in the Philippines themselves. The same is true of our Pacific coast. . . . . .
>
> Guam and Guantanamo, suitably fortified and with a superior fleet based upon them defend, respectively, the Pacific and Gulf coasts better than any local seaboard defences. They defend also more comprehensively. That is, the defence they afford defends also the coast trade and lines like those from the Gulf to the Isthmus of Panama; in short, all lines that lie behind them. For these reasons they appear to me rather first class ports, because they defend so comprehensively. . . . .

These words should be brought home to every one having to do with the national defence, and nothing clearer can be said or written to define clearly the necessity of and fix the location of our *outlying bases*: Guantanamo, Pearl Harbor, Guam, with Panama already provided.

As in the case of the home bases, it cannot be expected that these *outlying bases* will spring into full being at once. It may be years before they can be fully completed; *but the policy of the nation should be to continue the development at Guantanamo and Pearl Harbor as rapidly as the revenues of the country permit of funds being available, and to start at once the development of Guam;* and to devote to these purposes all development funds of the navy that might otherwise be used in any unwise extension or development of stations in home territories that will not be needed for the maintenance of the fleet on the completion of the bases.

FORTIFIED PORTS

If the principles of the policy outlined in the foregoing discussion are accepted, and the interests of the nation as a whole be placed before local interests and desires, and made our guiding light, the system of bases indicated above will prove all that is necessary to meet the needs of the fleet in war, and will eventually, when their development is completed, meet all those needs for as far into the future as can be foreseen. When *all* needs are met by those bases, then other navy yards and stations become superfluous, and their continuance an extravagance and a waste; for, as already demonstrated in this paper, and as so forcibly stated in the quotation from Mahan's Naval Strategy previously given:

> Economy of means and of money forbid the multiplication of maritime fortresses beyond the strictly necessary.

The question then arises, What is the action that good policy and the best interests of the country demand should be taken in the cases of the various navy yards and stations we already possess that are not marked for repair plants of bases, taking into consideration the immediate needs of the fleet, and the necessity of keeping that fleet prepared for war during the evolutionary period of putting the policy into effect?

The answer to this is, To use the facilities of such navy yards as we now have in operation to the best advantage for the upkeep of the fleet for as long as they may be needed; but to so conduct business in all those yards not marked as the repair plants of *bases* that no money will be wasted in extensions or development, and with a view to their being ultimately closed.

A naval station at Portsmouth, N. H., is not permanently re-

quired by either policy or strategy. The existing navy yard there, however, possesses some valuable facilities that are required at the present time for the upkeep of the fleet, and these facilities should be used for as long as may be needed. *But no money should be expended there for expansion or development, or for increasing the present facilities in any way;* and, as soon as development of the bases permit, the yard should be definitely closed and Portsmouth viewed only in the light of a fortified port, and used as such in naval warfare. It should be the first of the existing yards to be marked for closure, as being of least value.

Boston occupies in policy and strategy a position similar to that of Portsmouth; but on account of its far greater naval facilities, one of much more importance for the present and the immediate future. After the development of the New York and Chesapeake bases, it will have no reason for being as a naval station, and should then be closed and Boston viewed in the light of a fortified port. It will probably be many years, however, before the bases are developed to the state which will permit the closing of this yard, which is one of the most completely equipped on the coast. During this interval this yard should be continued as a subsidiary base in its present state, and full use made of all its existing facilities in fleet upkeep. But only such expenditures should be made there as are necessary to retain the present plant in efficient condition; and no large sums should be expended looking to development and expansion. From its superior equipment and present value in fleet maintenance, it should be the last of the unnecessary yards to be closed.

Charleston to the South occupies a position similar to that of Portsmouth to the North. Neither policy nor strategy requires the establishment of any kind of a naval base or station there; and while its existing facilities may be of some present value to the navy in fleet maintenance, they are small as compared with Boston; and the station there should be marked for closure following Portsmouth, when development of the bases has sufficiently advanced; and the port thereafter should be viewed in the light of and used as a fortified port in naval warfare. Meantime, since the plant and facilities there are better fitted for the care of small vessels than for large, the station, until closed, should be used for the upkeep of torpedo craft and their auxiliaries; and no money should be *expended there for further extension and development.*

From the point of view of policy, strategy and economy the cases of both Pensacola and New Orleans were very wisely attended to some years ago, when both of these yards were closed.

The Spanish War, resulting in our acquisition of Porto Rico and Guantanamo, with a supervision over Cuba, followed later by the acquisition of the Panama Canal zone, has advanced our Southern sea frontier from the Gulf Coast to a line from Hatteras through the Windward Passage to Colon (or more than a thousand miles from either Pensacola or New Orleans), with Porto Rico as an outpost. This leaves the Gulf of Mexico, from a naval strategic point of view, a closed sea far in the rear. As has been already demonstrated in the discussion of bases, the defence of this line rests on the outlying bases at Guantanamo and the Isthmus and the subsidiary base at Key West, supported by the home bases on the East Coast.

To consider any point so far withdrawn from the inevitable field of action, in case of a naval war in the Atlantic, as are either Pensacola or New Orleans *as a base,* is not only to violate every principle of strategy, but every principle of reason and common sense as well. That neither is needed for the maintenance and upkeep of the fleet has already been demonstrated by their actual closure for several years. The only logical conclusion that can be drawn from this is that economy of means and the best good of the nation require that their closure shall be permanent; and that both should only be viewed as fortified ports of refuge, in case of general disaster.

On the West Coast the only navy yards we have are within the limits of the proposed home bases, and have been discussed under that heading.

There has been, at times, some consideration given to the establishment of some kind of a naval station at San Diego, and we have at that port a small coaling plant. It is further proposed to establish there a fuel oil supply and a high-power radio station. This port is favorably situated, in regard to weather and other conditions, as a headquarters for ships in the Pacific exercising at fleet drills and maneuvers in peace; and the providing of a fuel supply there of both coal and oil is both wise and economical. Climatic and other conditions are also favorable for work with aircraft, and it would be wise to establish an air plant and training school there as well. But beyond these, no thought

should be given to the establishment of any kind of navy yard or station there, since neither policy nor strategy require one. Its role in war can be fully subserved by viewing it in the light of a fortified port, as it is.

In the Philippines we still have some remains of a station at Cavite and an embryonic station at Olongapo. This latter, since we already have it, and it possesses some useful facilities, may be considered as a certain peace asset which may be used for the upkeep of ships on the Asiatic Coast as long as peace continues. In war it would have to be abandoned, and such of its material as could be moved retired behind the fortifications of Corregidor. It is therefore contrary to sound policy to expend any money there beyond that strictly necessary to keep the plant in a condition to perform its peace functions.

The present and future status of the Philippine Islands is now somewhat nebulous, but whether a final decision be reached that we are to hold them, or whether a contrary decision for their abandonment should prevail, for complete mastery of the sea and effective naval operations in far eastern waters, a subsidiary base somewhere in these islands will be a necessity. It would therefore be the part of good policy to select now the strategic site; and if the final decision be for the abandonment of the islands, this site should be retained for future development as in the case of Guantanamo in Cuba.

In the meantime, however, and until some definite national naval policy is adopted, it would be most unwise to expend any money on naval development anywhere in the Philippines, but we should make use of what peace facilities we now possess there; and in the event of war, make what use is practicable of the fortified port of Manila.

OTHER BRANCHES OF THE SHORE ESTABLISHMENT THAN BASES AND NAVY YARDS

In the earlier part of this essay it was stated that the ideal naval establishment, besides the central administration, or Navy Department, and the bases, should contain a system of schools for education and training, and of stations for special technical purposes and experimentation. The schools for education we now have at the Naval Academy and the War College. The schools for training we have at Newport, Washington, Norfolk, Charles-

ton, the Great Lakes and San Francisco. Some of these may not be in the best location, but good policy calls for their encouragement and extension. To these should be added at least one properly equipped Air School on each coast.

Stations for special technical purposes and experiment exist at the torpedo station, Newport, at Washington, Indian Head and Annapolis. These are all most highly needed and should meet with all the encouragement and development possible; for on them depend not only the creation of a large part of the war material of offence for the navy, but the advance and improvement in this material and in machinery.

In establishing such special stations the principle of economy requires that they should be limited in number to the strictly necessary, the same as in bases. Their location, unlike that of bases, should be governed by the economic principle only, since their operations do not enter the field of strategy, but that of production and experiment. They are, or should be, established only to meet needs in technical work that cannot be met otherwise as well, for the assurance of the perfection of our war material; and while great liberality should be used in improving and perfecting such special stations as are necessary, economy should absolutely prohibit the establishment of any that are not. In the opinion of the writer, we have now in number and kind *all* of such stations the needs of the navy call for; and economy and good policy require that these be extended and improved, and no other kind provided for.

SUMMARY

All the foregoing discussion has been earnest endeavor:

First. To apply reason and logic to the teachings of history and the lessons of war and strategy, and to deduce therefrom the fundamental principles that should underlie our naval policy for the shore establishment for the best good of the nation.

Second. To apply these principles to the shore establishment as it exists today, and evolve from this application, for future guidance, the elements of a naval policy that will give to the nation the greatest return for the money expended, in assuring the national safety by producing the maximum of sea power the amounts appropriated are capable of producing.

The elements of the policy so deduced and proposed for consideration may be summarized in brief as follows:

(1) A Navy Department organized for war.

(2) The continued support and development of the existing schools for naval education and training, and the existing special stations for technical work and training. To these add a special school with efficient plant for air training on each coast.

(3) The gradual development to completion of four great naval home bases, at New York, the Chesapeake, Puget Sound and San Francisco Bay.

(4) The continued development of the Philadelphia navy yard as a subsidiary base for building and manufacturing purposes and as a home for the reserve fleet, auxiliaries and advanced base outfit and personnel; and of Key West as a subsidiary base for torpedo vessels.

(5) Continue the use of the existing navy yards at Portsmouth, N. H., Boston, Mass. and Charleston, S. C., now in operation, for as long as their use may be necessary for the upkeep of the fleet, pending sufficient development of the home bases to fully accomplish this upkeep; but expend no money on any of them beyond that necessary to keep their existing plants—without extension or development—in efficient condition for performing their present work; and conduct business in all of them with a view to their being eventually closed as navy yards, when the development of the bases has sufficiently progressed to permit of the disuse of their facilities.

(6) Continue the closure of the navy yards at Pensacola, Fla., and New Orleans, La.

(7) Continue and push to completion the outlying bases at Guantanamo and Pearl Harbor, and begin the work of founding a complete outlying base at Guam. The needed outlying base at Panama has been already provided for under Canal appropriations.

(8) Select a site in the Philippines for possible future development as a subsidiary base; and continue to use such facilities as we now have at Olongapo; but expend no money for naval purposes anywhere in the islands at this time, beyond what is absolutely necessary to keep the Olongapo plant in condition to do its peace work.

To carry out the proposed policy and adopt the reforms sug-

gested requires the placing of the national interests before all others; and will further require the full and patriotic cooperation of Congress, and a revised method of making naval appropriations. Let us hope that this will come in due time, now that indications point to consideration being given to the adoption of the budget system; and that there will follow a more comprehensive and less detailed method of drawing appropriation bills, under fewer and more general headings, accompanied by a strict accountability of the administrative and disbursing officers of the government, which will permit of the total amount of the money of the people appropriated for naval use being used to the best advantage of the nation.

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EARLY SIGNS OF INTENDED INVASION

By First Lieutenant Renato Tittoni, U. S. Marine Corps

Rumors of intended invasion are likely to cause alarm to such an extent in this country that it would be the topic of conversation in practically every American home, therefore it would appear advisable to consider what may be the earliest "unmistakable signs" of such an undertaking.

The first point to be considered would be what could be learned through the business world if an invasion were to be secretly attempted.

Taking the world of finance, if any warlike designs were in contemplation, the gold would have to be so greatly hoarded up that the movement would be felt on the Bourses and suspicion aroused, provided that it took place at any other time than the usual draining. The European powers, however, have already made provisions to accumulate a war fund, as is shown below:

Bank of France	720,000,000	gold.
Russia	725,000,000	" and silver.
Austria-Hungary	285,000,000	"
Germany[1]	240,000,000	" " "
England	170,000,000	"

London being the center of money markets of the world the financial crisis is first felt there, but it is pointed out that the autumnal drain (when most settlements are made of the trade balances) of gold nearly always necessitates the raising of the bank rate. For instance in August, 1907, the bank rate in London was raised from 4% to 4½% and in the early part of November, 1907, it had reached 7%. Now at the outbreak of the Franco-Prussian War the bank rate was 3% but the highest rate reached that year was 6%; therefore it will be seen that the financial crisis of

[1] Germany also has a war chest amounting to millions of dollars, the money for which was provided out of the indemnity received from France in 1871-2.

1907 had practically the same effect in the market as the outbreak of the war.

The great European banks keep large credits in London which are used in the short loan market but it does not seem probable that a hostile power, when she already has a war chest, would risk the success of sudden invasion by attempting to withdraw her London credit.

Colonel Concannon, an eminent English authority and business man, states the following:

> If it were worth the while of such a hostile power to run the risk of revealing its intentions, the process by means of which the withdrawal of gold would be accomplished would be the raising of the bank rate in such country which would cause exchange on that country to fall to such a level that shipments of gold on a large scale would take place. Of course, if we say the German bank rate were to be raised to an unduly high level it might arouse suspicion that something abnormal was wrong, particularly if it occurred at a period of monetary ease; but if it took place at a period of active trade, when money was universally dear, it would attract little attention, and might be put down to an acute internal monetary crisis.

The movements of prices of international stocks might possibly give a little more indication of a hostile intention. The sources of information accessible to great bankers are almost illimitable, and, however the secret might be kept, it would be almost impossible to keep the matter from the knowledge of the great international banking houses. This, of course, would lead to a mysterious volume of selling, but such selling need not be held to indicate a pending hostile act.

It would create an uneasy feeling, but the people in possession of the information would not naturally give away their exceedingly valuable knowledge of the situation until the last moment.

The stock exchange and the money market gave no preliminary warning of the outbreak of the Franco-Prussian War. On Friday, July 15, war was declared, and on the preceding day Consols were quoted at 92, while the bank rate was 3%. On Monday, July 18, Consols were quoted at 89¾ and on July 21, the bank rate was raised to 3½%, on July 23, to 4%, on July 28, to 5%, and on August 4, to 6%. Of course the war occurred at a period of monetary ease; had it taken place during the usual period of the autumnal drain for gold it might have had to have been raised to a very much higher figure; but the point is that the money market did not take alarm until about a week after war had been declared.

In the case of the Russo-Japanese War, the market had, of course, been prepared for a long time for an unfavorable development of the dispute, but it was not until two days after the rupture of diplomatic relations that Consols had an appreciable fall, and Japan 4%, sterling loan, which was quoted at 74 on January 2, was quoted at 74½ on February 5, and did not move until February 8, when it dropped to 67½.

For these reasons therefore, it would not be wise to look to the money market or to the stock exchange to give definite warning of any intended raid.

The coal market is so closely watched, each company having a fairly regular clientele, that suspicions would be aroused if a larger quantity of their coal was taken at any time in any one direction.

The official coal output in 1911-12 for the countries mentioned was as viz.:

	Short tons
United States (1912)	534,466,580
Great Britain (1912)	291,666,299
Germany, (1912)	285,974,649
Austria-Hungary (1911)	54,960,298
France (1911)	43,242,778
Russia and Finland (1911)	29,361,764
Belgium (1911)	25,411,917
Japan (1911)	19,436,536
China (1911)	16,534,500

During the fiscal year 1913, there were consumed by the fleet 658,813 tons domestic coal purchased, 900,092 plus tons; 45,748 plus tons foreign coal purchased.[2]

The wheat crop is the main staple in the foodstuffs, which are as a matter of course very essential factors in case of war. We are at a decided advantage in this supply.

In 1909 we produced about 750 millions of bushels with a population of 88 millions and exported several millions of bushels to foreign countries. We could draw enormous supplies by internal communication which a hostile navy could not touch.

The matter of water transportation for troops is one in which we are at a decided disadvantage; the matter has been, however, so often talked about and so luridly depicted that it is not necessary to draw upon it.

[2] Extract from annual report of the Paymaster General, United States Navy.

The merchant fleets of continental powers have grown so steadily that a concentration is becoming less and less difficult. Lloyds' register of 1909-10 shows gross tonnage of steam shipping over 100 tons measurement as follows:

	Vessels	Tons
Great Britain and Colonies	9758	17,702,714
Germany	1808	3,889,046
France	884	1,445,976
Italy	437	961,132

The preponderance of the British mercantile shipping brings them to the superior stand as to their navy, but even so any contemplated invasion by them before giving preliminary intelligence is impossible in this era of wireless telegraphy.

Electrical communications are a far more dominant factor in maritime operations than in purely land campaigns, owing to the fact, that, as a general rule, the theater of war at sea is of vast extent and may indeed cover the greater part of the globe. And the introduction of wireless telegraphy of recent years is a fresh step in advance, of which the full possibilities have perhaps not yet been gauged. Thanks to electricity each belligerent can watch the movements of the other, can discover the position of hostile fleets, can be kept informed of the concentration and sailing of military expeditions, and can execute naval combinations to meet each particular case with a celerity and precision unknown before electrical telegraphy was introduced. But the accepted doctrines of naval strategy have not been changed by this; the objects to be sought after remain the same, the methods by which these objects are attained are little different from what they were before.

The covering of the sea by merchant shipping and the sensitiveness of the markets may also be taken into this consideration.

This brings in the need for a greater navy, even if the Panama Canal were considered completed. The navy being the first line of defence the enemy must first reckon with our navy, and the necessary standard must be maintained no matter what the cost may be. A scattered empire, if its distant colonies and dependencies be not knit to the mother country and to each other by communications enabling its military strength to be concentrated at any point where the realm is threatened, whether by internal disorders or by external attack, must fall to pieces. If these

communications lead across the ocean they must be protected by an adequate navy. For lack of sea power Spain has fallen from the proud position of dominating a whole continent, and owning what was at one time the most wealth-giving archipelago in the world, to the position of a second-class power. It was due to maritime weakness that France was deprived of her Indian Empire when it was little more than a conception of dominion to come.

The United States is on a par with Great Britain relative to its distant possessions, and the constant call on the American navy to uphold the "Monroe Doctrine" makes it a necessity that its navy be maintained in the strongest status possible; the following, which is applied to the British navy by an English authority, would apply to the United States:

> The maintenance of the British Empire on its present basis depends primarily upon sea power. And this is not merely because a paramount navy is essential for the security of its maritime trade and its huge mercantile marine, but because military forces must be maintained to defend its colonies and dependencies and may have to be strengthened in the hour of danger. The army must be distributed over its vast area and must be kept up to the adequate strength, so as to preserve its possessions against disorder from within and against aggression from without. Facilities must exist for moving these military detachments from colony to colony and from province to province when emergencies arise. And owing to geographical conditions these transfers of troops must take place over-sea, which becomes impossible without naval preponderance in time of war.

As the United States has no merchant marine to make a transfer of troops or adequate transports to gain the same end, it will be a difficult problem to face when the occasion arises, and steps should be taken to obtain transports and an adequate navy to protect them.

The very people who are opposing a greater navy would be the first ones to howl for one, in the event of an intended invasion.

The relative standing of the United States Navy as compared with those of the leading powers appears on pages 186 and 187 of the NAVAL INSTITUTE PROCEEDINGS, No. 149, January-February, 1914.

A military authority gives 70,000 men as the hypothetical invading army in the first stage, and 200,000 was given as the tonnage requirement for the transporting of this body of troops, taking into consideration that infantry could not be taken as the general

basis, but that the invading army must be composed of all arms, without mixing units or splitting up of organizations; together with horses, guns, ammunition, and stores to operate immediately.

Therefore for a power to collect the 200,000 tonnage, allotted to different units according to suitability, divided into fleets by speeds and efficiently convoyed before the expedition could be despatched with any hope of success, the contemplated invasion would have two great difficulties to face:

a. The efficiency and watchfulness of our navy,

b. The difficulty of securing suitable transportation without conspicuous preparation.

Transports filled with troops are in the present day to all intents and purposes helpless against attack. In the Greek and Roman era, and at a later date when fighting ships took the form of galleys and analagous craft depending partly upon oars and partly upon sails for motive power, soldiers could use their arms, could engage in the hand-to-hand conflicts which took place when rival vessels grappled, and were not always clearly distinguishable from the naval personnel. But with the gradual development of artillery, troops when afloat have more and more degenerated into becoming merely passengers, unable to offer resistance if the vessel they are in is engaged by the enemy. And under existing conditions the troop-transport, unless it can escape from the foe by superior speed, is absolutely at the mercy of insignificant torpedo craft or gunboats, should they assail it. The modern steamer possesses no power of offence, it affords no protection even against the smaller natures of ordnance carried by fighting ships, it has no searchlights to observe the approach of torpedo boats at night; its only hope of security, therefore, lies in its engines, if these be of sufficient power to drive the ship faster than the assailant can go—and such conditions are seldom found for the conveyance of troops. The sinking of the "Kowshing" at the opening of the Chino-Japanese War and similar incidents of a later date in the same seas, serve as striking examples of the helplessness of the troop-transport when attacked.

It is true that the radius of action possessed by the destroyer, the torpedo-boat, and the submarine is somewhat limited but anywhere within their radius of action a flotilla of torpedo-boats and destroyers is a most effective "fleet in being" as against a military expedition over-sea. Torpedo-boat stations afford an inval-

uable protection to a coast line against hostile descents. What occurred at Port Arthur at the outset of the Russo-Japanese War shows the risk run, even by fighting ships provided with search-lights and quick-firing guns and anti-torpedo nets, if they are assailed by a swarm of these hornets of the sea when anchored in the open. The situation of a flotilla of helpless transports attacked under like conditions would be desperate; and, although a fighting fleet when under way at night has not, perhaps, much to fear from the enterprise of torpedo-boats, that does not apply to at all the same extent to an assemblage of merchant steamers engaged in conveying any considerable military expeditionary force across the sea. The failure of the Russian torpedo craft in Port Arthur to interfere in the least with the disembarkation of a great Japanese army on the coast, less than one hundred miles distant from where they were lying, is one of the most singular circumstances in the story of the late war in the Far East. The fact that the channel into the harbor of the fortress was temporarily blocked against the exit of battleships and cruisers does not account for what remains, at the time of writing, a mystery.

Then on the other hand suppose the transport fleet to have successfully run the blockade. The risks and difficulties which attend troops in disembarking and after disembarking owing to weather and owing to possible action from sea or shore are to be contended with.

Then again the land force has probably had time to make a sufficient preparation to receive the hostile force. Colonel Callwell in his "Military Operations and Maritime Preponderance" states: "The moral factor can never be overlooked in war, and it is not unlikely to play a particularly important part when an embarkation takes place in face of the enemy. It is unusual for a military force which has been successful in its operations to take to its transports harassed by the adversary. An army rarely withdraws by sea from territory in occupation of hostile detachments, unless it be yielding to a superior force. It does not, of course, of necessity follow that the embarking troops have been beaten, or that they are even in any serious danger. They may be retiring after a mere feint, or they may be performing a part in some profound strategical combination of an offensive character involving transfer of force from one point to another on the coast. But, generally speaking, when an operation of this nature takes

place, the soldiers who are returning to their ships are doing so because the have met with reverse, or to avoid reverse, and they are therefore necessarily fighting under depressing conditions. This is unfortunate, because an embarkation in face of the enemy must in itself be a dangerous undertaking. A landing may be effected to a certain extent as a surprise even when hostile forces are drawn up to contest it; but the presence of the transports and boats necessarily discloses the intentions of an army which is contemplating withdrawal by sea, and it marks the spot where the withdrawal is to be carried out. An operation of this class must in its final stages be tantamount to a retreat, and to a retreat executed under circumstances where confusion and misunderstandings are peculiarly likely to arise, and where losses must almost inevitably be encountered and a rear-guard operation involved."

These conditions stated above would naturally take place if the enemy had successfully run the blockade, made a landing, and later encountered troops who were prepared to meet them, which no doubt would be the case with our rapid interior communications.

After all the pro and con of practical possible invasion, it is reasonable to suppose that the invasion would not be attempted until after a long and earnest negotiation proved futile, or an exceptional complication arose, provided, we were not dealing with other than a civilized power.

The cost of the war, loss of men, set-back in commercial progress, and above all the acquisition or loss of territory would be carefully taken into consideration by the powers involved.

The following is a table of the cost of the most important wars since 1853:

War	Date	Loss of Life	Cost
Crimean	1853-4	785,000	$1,700,000,000
Italian	1859	45,000	300,000,000
Germany and Schleswig-Holstein.	1864	3,500	35,000,000
American Civil War	1861-5		
Northern Army		281,000	4,700,000,000
Southern Army		519,000	2,300,000,000
War between Prussia, Austria and Italy	1866	45,000	330,000,000
Franco-Prussian	1870-1	853,000	2,200,000,000
South African	1899-1902	68,700	1,350,000,000
Russo-Japanese	1904-5	485,000	2,515,000,000

The diplomats of nations realize that commerce means not merely the success but the life of nations, therefore, war is not likely to occur; no other good reason can be given for China being left intact, for the late tolerance of affairs in Turkey, for England continuing in charge of Egypt, for Germany remaining in possession of much of her present territory, and for many other burning questions resting in statu quo. But at the same time there is no need to be led into a false sense of security; the best way to avert war and maintain peace is to have a sufficient navy, maintain a large standing army, and let every able-bodied young man be trained in the auxiliary force for the defence of his home in such a way as not to seriously affect his commercial life, but surely to better his physical and moral condition.

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NAVAL INSPECTION DUTY IN MANUFACTURING DISTRICTS

By LIEUT. COMMANDER T. D. PARKER, U. S. Navy

Previous articles in the NAVAL INSTITUTE PROCEEDINGS have covered inspection duty at navy yards [1] and at shipbuilding plants.[2] This paper deals with the third kind—inspection of naval material in a manufacturing district.

In these notes the writer offers plain facts rather than opinions. Without pretending to speak *ex cathedra*, he can at least show how this class of inspection duty dovetails into the other two, and describe it for the benefit of those who have done no such duty at all. In what follows the Boston office (under the Bureau of Steam Engineering) in the district of Eastern Massachusetts, is particularly referred to. Features of work in the Pittsburg district are described in an interesting article by Captain Walter F. Worthington, U. S. N., in the Journal of the American Society of Naval Engineers for August, 1912 ("Government Testing and Inspection of Material for the Naval Service").

While district inspection work has much in common with that at shipbuilding plants, it relates more particularly to materials (including also small machines) to be installed on ships or at naval stations—while shipyard inspection covers the actual installation on shipboard, and work on the ship itself. Navy yard inspection also includes installations on shipboard, but is curiously different from district inspections, in that what the district "Inspector of Material" does is exactly what the yard "Inspection

[1] "Inspection Duty at Navy Yards," by Lieut. Comdr. Thomas D. Parker, U. S. N.: NAVAL INSTITUTE PROCEEDINGS, June, 1912; Vol. 38, Whole No. 142.

[2] "Notes on Inspection Duty at Shipbuilding Works," by Rear Admiral A. B. Willits, U. S. N.: NAVAL INSTITUTE PROCEEDINGS, December, 1912; Vol. 38, Whole No. 144.

Officer" does not do. The latter inspects work done at the yard only, leaving the inspection of *purchased material* to representatives of the manufacturing departments. This is more logical than it may seem, for the manufacturing people know exactly what they want, and are not (in this case) passing on their own work. Perhaps the inspection officer might make these inspections also; but a conference of commandants in 1910 recommended otherwise, and the new Naval Instructions so provide (Art. 4672, par. 1).

The fact that some government representative is charged with a "check" inspection at the point of delivery (navy yard, ship, or shipyard) has an important bearing on the efficiency of the district offices. The inspector and his assistants know that if their work is careless some officer not interested in shielding them is liable to discover their oversights. The government is also doubly protected from the manufacturer who tries to "put it across" the first inspector. Contracts clearly cover this point.

The new Naval Instructions (Art. 4671, par. 2) provide very sensibly that the "further inspections at the navy yard shall be confined to ascertaining whether the full amount has been delivered in good condition and without substitution." Ordinarily the repetition of tests (except operating tests of machinery) is useless and vexatious.

Passing to another relation—that with the Navy Department: Inspectors of Material (Bureau of Steam Engineering) work directly under an officer in the department who acts (under the Chief of Bureau) as a sort of "Director of Inspectors." He receives reports and collects data from the various district offices; issues forms and instructions; prepares or directs the preparation (and revision) of specifications. Through him district inspection work is standardized.

It seems a pity (in passing) that navy yard inspection work is not centralized, or directed, in a similar way—perhaps under the "Aide for Inspections" or under the "Director of Navy Yards." At present there is some duplication of work; and yard inspectors act independently, without standardization of methods or results. Of course the direction referred to should be technical, and in no way lessen the authority of the various commandants. To illustrate what is meant: Uniform instructions might be issued regarding physical tests and analyses of material manufactured in the yards.

GENERAL ROUTINE

Returning to district inspections: It may be well to give a brief outline of the routine of a naval inspection office.

When a contract is awarded to a manufacturer in the district, the bureau concerned (or a navy pay office) notifies the inspection office, directing (or requesting) inspection. If an order is issued from a contractor outside to a sub-contractor or manufacturer within the district, an approved copy of the order is received from the Inspector of Material or Inspector of Machinery in whose bailiwick the original contract was placed. Through standard specifications filed in the office, and referred to in the contract or order, or through approved drawings, etc. (further detail would be useless here), the inspector is informed of the exact requirements for the material to be inspected. His province is to apply these, like a yard-stick, and report results.

On receipt of the notice described, the office communicates with the manufacturer, requesting him to issue an "inspection call" as soon as the work is ready.

When the call comes—usually by letter or telephone—it is entered in a book, with the name of an assistant assigned to make inspection, and with the file number of the folder containing the order or contract and related correspondence. It is very important to look this up in advance of the inspection, in order to be familiar with the exact requirements as to quality of material, tests to be made, etc., and any modifications of these in the attached correspondence. The manufacturer should not be relied upon for this information, though he will usually supply it correctly; nor should he offer material for inspection unless previous notice has been given the office—for in this case it is difficult for the inspector to tell just what the requirements are, errors are likely to occur, and time is wasted.

Each assistant should keep (1) a note book, in which he jots down notes regarding the inspection to be made (as indicated above), with a brief record of inspections finished; and (2) a journal giving a record of trips made, trains or cars to take, expenses, places to eat, officials of the plant, details as to the plant, etc., all of which may be valuable for reference or to pass on to a successor. In this connection, Admiral Willits' advice to a young shipyard inspector is valuable: Study specifications piecemeal, not all at once. As each call is received, master the speci-

fications, objects sought, tests to be made, metallurgy, etc., for the case in hand.

Knowing exactly what he is to do, the assistant answers the call as promptly as possible. At the Boston office this usually means the same day, or the next if calls conflict. He examines the material or machine for surface defects, checks essential dimensions, and makes the tests required by specifications. If the manufacturer lacks facilities for these, they are made elsewhere at his expense. In most cases a tensile test (for elastic limit, breaking stress, and elongation) must be made, and a chemical analysis —the latter, however, by a government chemist. Inspection for *quantity* is made at the point of delivery.

After satisfying himself that the material or machine is satisfactory, the assistant stamps it (or the containing box) with an "anchor" stamp. If inspection is not complete, a "US" stamp is used for identification. Manufacturers are cautioned not to ship until the acceptance (anchor) stamp has been given, or other modification of final acceptance issued. Each shipment is accompanied by a "shipping memorandum," signed by the inspector, giving a detailed statement of what the shipment should include and what stamps it should bear. The consignee will not receive the material unless it is properly stamped or he is otherwise informed as to acceptance. Articles rejected either at the place of manufacture or at a point of delivery must be replaced by the manufacturer.

SCOPE OF WORK

The work of the office requires frequent trips to plants in Boston, or in neighboring towns. The most distant points usually reached are Taunton, Mass., 37 miles; Providence, R. I., 45 miles; and Warren, Mass., 73 miles. A large proportion of the plants are in the immediate suburbs of Boston. Pawtucket, Worcester and Providence also issue many calls. Among the chief works visited are those of the General Electric Company of Everett and Lynn; the Blake Pump Company of Cambridge; the American Tube Works of Somerville; the Revere Rubber Company of Chelsea; the Brown & Sharpe (tool manufacturing) Company of Providence, R. I.; the Holtzer-Cabot (electrical) Company of Brookline; the Taunton-New Bedford Copper Company of Taunton. Many others might be named, but these give a fair idea of the scope and nature of the inspections. One assistant gives most

of his time to the large works of the General Electric Company; another to those of the Blake Pump Company. A regular weekly trip is made to the Taunton-New Bedford Copper Company's plant. Otherwise calls are answered as received. Except for certain past delays as to analyses, contractors have nothing to complain of as regards delayed inspections.

Generally speaking, the work of the Boston office is in two parts —mechanical and electrical. Besides the inspector, one commissioned assistant, and two clerks, there are two civilian experts for the mechanical or general engineering inspections, and two for the electrical.

RELATIONS WITH MANUFACTURERS

To begin with, the general attitude of the inspector to the manufacturer (and vice versa) is all important. In this connection, I cannot do better than quote the words of Admiral Willits in the article referred to above:

"The[3] attitude most desirable for an inspector to assume is that of a co-worker with the contractor for the purpose of securing the very best possible results."

This does not involve any lowering of standards or waiving of the just rights of the government: but does require tact, knowledge of human nature, technical knowledge, and a spirit of helpfulness in the inspection. Technical advice, suggestions as to governmental procedure, correction of oversights, etc., may more than compensate the manufacturer for the cost of inspections or even of occasional rejections. This has been illustrated in the Boston district. Moreover, as Captain Worthington points out[4] the inspector can render great service by forestalling mistakes that would be disastrous to the contractor.

To give a better idea of the actual duties of an inspector (assistant), it may be well to describe a typical inspection. A report comes in that 1200 condenser tubes (of admiralty metal) are ready. If no particular specifications are referred to in the order, the inspector looks up the standard specifications given in a bureau pamphlet.[5] Under "Specifications For Seamless Tubes For Con-

[3] UNITED STATES NAVAL INSTITUTE PROCEEDINGS, December, 1912, p. 1276, Vol. 38, Whole No. 144.

[4] Journal of the American Society of Naval Engineers, August, 1912, p. 940.

[5] "Specifications for Inspection of Material, Part II, Non-Ferrous Materials" (Part I covers Ferrous Materials).

densers" he finds a statement of the required tests. On arrival at the works he gets in touch with the manager or foreman, and in company with him examines the pile of tubes. It is of course impracticable to examine or test each tube. In this case he is directed to take at random one per cent of each lot of 600 (or less) as representing the lot. First, however, he makes a general inspection of the lot, noting the color (indicating degree of annealing), uniformity of appearance, amount of sag, presence or absence of scale, slivers, and other defects. He then measures the micrometer thickness of the test tubes (checked by a comparison of estimated and actual weights), witnesses an hydraulic test, a hammering test (tubes must stand hammering almost flat without fracture) and an expanding test (to a diameter one-sixth in excess). To offset the hammering test (to show that the tubes are not too brittle) is a compression test (to show that they are not too soft). As this requires a testing machine, it may have to be postponed. Drillings or shavings are taken for chemical analysis. When other, larger tubes are inspected, tensile test pieces also are cut and stamped for inspection.

If the article inspected is a machine of any kind, the inspector is chiefly concerned with its proper functioning. In many cases he also examines the parts for defects; but in the case of an assembled machine it may not be practicable or advisable to look at each individual part. If a number of similar articles, such as gauges, safety valves, etc., are being inspected, it seems advisable to test each for performance and to select a certain percentage for detailed examination.

The operation test may cover hours or days. In the case of a turbine generator, for example, a "water rate" is taken; a heat test is run off—with many thermometers about the coils, etc.; a commutating test is made (under various conditions of load), to detect any undue sparking—and so on. These tests require much equipment with a large personnel, and cover several days.

It will be seen that inspections are often time-consuming and costly, but when one considers (as in the case of the tubes above) that the price may be several thousand dollars, and considers the conferences, luncheons, automobile rides, that precede purchases of this amount in other walks of life, it does not seem unreasonable to spend hours investigating a lot of material on the fitness of which lives may depend.

It will also appear that many of the tests are not highly technical, but decisions based on them require experience and a trained judgment. In doubtful cases (unless specially urgent) an inspector should go slowly and make his decision after "prayer and fasting."

In one exceptional case it may be well not to claim the exact "pound of flesh." That is, when replacement of material, suitable if not perfect, would involve delay injurious to the government itself—for instance, when rejection of the article would send a ship sailing away with urgently needed work unfinished. Each case must stand on its own merits: but it does seem that more could be done, by post and telegraph, to inform the inspector of urgent cases and prevent the following of routine when people on ships are hoping against hope that a machine or casting will get aboard before the brows are hauled ashore.

The question of the inspector's "discretion" is always a delicate one. Of course, as a guiding principle, the specifications should be followed strictly. They are the law in the case. Until the individual assistant knows his manufacturer well he should be slow to accept unverified statements or to omit any detail whatever. With a firm whose output has proven universally good, and whose representations have always been reliable, the repetition of certain tests already made and certified to may be unwise, but it is usually presumable that if the bureau carefully indicates a test in the specifications, it wants the test made.

The following illustrates the danger of accepting mere statements, even where no trickery or deception is intended. The writer was inspecting gauges of a special, unusual type. The order called for "Lane gauges" (with double tubes). The manufacturer asserted (with apparent sincerity) that it was mechanically impossible to install the Lane mechanism in such a gauge—and had accordingly supplied the Bourdon movement. Though the inspector did not offer to design the two-spring gauge on the spur of the moment, he had just seen one of this "impossible" kind at another plant—and the fallacy was nailed.

Though caution and thoroughness are thus necessary, manufacturers (especially their city representatives) are strong for "discretion" on the part of the inspector. This line of argument—"Of course our material couldn't stand up under such a test as

that! but it's the best on the market, and no inspector with a little discretion" etc., etc., may be called the Standard Kick.

The legitimate "kicks" of manufacturers—there are some—should be carefully noted. It is an important function of the inspection office (a tentacle of the Navy Department) to pass these up. If the manufacturer makes sensible criticism of the specifications, as to either requirements or tests, the assistant should report to the inspector and the latter to the bureau, otherwise the manufacturer thinks the bureau deaf when it has never had a chance to hear. Efficient and well-disposed experts can readily make comments that will cause a revision of specifications.

To systematize the handling of such comments and reports, it is suggested that printed forms be supplied both assistants and manufacturers, with spaces for date, name of plant, name of critic, number and date of specification, and for brief, specific criticism. These should be made out in duplicate, one copy to be filed in the district office, the other in the bureau. The distribution of such forms would itself be suggestive. Whenever specifications are "in the limelight" for revision, these files could be quickly referred to.

As others have pointed out, contractors for government material have troubles and vexations (not usual in their ordinary dealings), due not to the *fault,* but to certain *handicaps,* of the government. The department is hampered by inflexible laws made by Congress; it has to consider bids from good and bad dealers alike and protect itself from the latter; it must supply material of extra high quality for military purposes on board ship, etc. Bearing this in mind, it seems very desirable to cut out any unnecessary vexations. Any step toward meeting fair complaints is a step toward efficiency and economy for the government. If specifications are unreasonable in any way they should be promptly changed. Right here, in justice to the government, it must be said that earnest effort is made to keep many specifications to date and to weed out earlier faults. For an instance, at random, specifications covering "seamless copper tubing, etc.," have been issued on the following dates, each issue superseding the last: April, 1902; February 15, 1909; June 25, 1910; November 15, 1910; August 1, 1911. Recently new specifications for steam gauges were issued. These have been submitted to the leading manufacturers in the district with a request for detailed criticism. Copious, oral and

written discussion (shared in by assistants who have inspected gauges at the various works) has followed; all questions raised have been thoroughly threshed out; and recommendations for further slight revision submitted by the inspector.

Another desirable aid to the contractors, as suggested above, is promptness of inspection. Yet the question of economy must be considered; for it is cheaper to combine inspection trips with a slight consequent delay. Cooperation on the part of manufacturers is needed to cut down the cost of successive trips following on each other's heels.

Naturally the most popular "aid" is the waiver; that is, the decision of the bureau, on recommendation of the inspector, to waive certain details of the contract. This action is frequently requested and sometimes recommended. In deserving cases, where the defect seems technical, the inspector may point out this means of relief and indicate the procedure to be followed. It seems preferable, in such cases, to reject and recommend a waiver, rather than to let down the bars and accept, off-hand, material that is not quite what is called for. In this case "red tape" serves a purpose.

Advice on the above and other points is especially valuable to the manufacturer taking his first naval contract, who does not know whether to address his moan to the Secretary of War or to the Postmaster General. "Government" is "government" to him. It would expedite business if a special letter were sent at the start, to each such manufacturer, explaining what he is "up against" in the way of inspection, procedure, etc. A printed circular is now sent to each old or new contractor: but printed circulars have a fatal trend towards the waste paper basket. Frequently finished articles are rejected at great loss to the dealer when they clearly do not meet the specifications, and when a man familiar with government methods would never offer them for inspection. Recently, for instance, the writer made a trip to inspect some valves which, by contract, were to be adjustable between the limits of 10 and 225 lbs., though designed for immediate use at 30 lbs. The springs could stand no more than 100 lbs.

"Those springs are weak for the high pressures!"

"Oh, yes!" said the foreman, "The boss noticed that; but he said he supposed it would be all right." Unluckily, it was not.

It has been suggested that new firms be furnished with cards similar to the instruction cards posted up about a workshop.

DUTIES OF THE INSPECTOR

As to the function of the inspector—the head of the office: With the present force in the various offices, it is seldom necessary for him to make inspections in person. Having received a prior training, he acts as the administrative head; receives and digests reports; collects data from his various assistants; attends to correspondence with manufacturers on the one hand and with the department on the other. His routine presence in the office is important in that he acts as adjuster, buffer, interpreter, between the navy—whose ways he knows—and the contractors—whose ways he knows; and to whom the navy (even the division of material) is *terra incognita*. An affable inspector, who can discuss technical questions intelligently, and who will take pains to remove misunderstandings, is a valuable asset—provided, also, he can use a "single stick," when necessary, to protect his government from the contractor whose work is *almost* right.

SPECIFICATIONS

It will be clear, from the preceding, that the question of inspections is closely related to that of specifications. These are issued by the department; but the inspector may prepare them, or he may make suggestions for revision. It is therefore very important that the district offices should collect data for specifications, in order that these may be kept in line with the latest and best commercial practice. A routine for the handling of criticisms and suggestions has been proposed above. At regular intervals the files should be gone over, and good things passed on to the bureau. Recommendations are often made at present; but sometimes the manufacturers refrain from speaking out; sometimes assistants are silent after hearing them; and sometimes inspectors are reluctant to offer advice to higher authority.

If specifications are made just right the great desideratum will follow—they can be adhered to with absolute strictness.

SINS OF MANUFACTURERS

Some manufacturers groan and gnash their teeth over naval contracts. This is partly their own fault (for the other side of the picture see below).

One mistake is like that of the bluejacket who "gets disgusted and quits." Sometimes if their criticisms (good or bad) fail to carry through, they throw up their hands, curse the navy, and purse their mouths tightly; or, shying at a little red tape, they say nothing where there is much to be said. A better understanding as to causes of delays or requirements (an understanding the inspector may promote), and a little more persistence in saying what they think would be a great help to themselves and to the government.

Another trouble is the confusing of different branches of the government alluded to above. Army rules are applied to navy contracts, and the reverse.

A frequent cause of loss is the failure to request chemical and physical tests of material before working the same into finished form. After machining and threading a thousand pounds of bolts the company finds that the stock used was too weak or brittle—and swears a blood-curdling oath never to take another government order.

Still more common is the failure to read over (or to regard) the terms of the specifications. A large order has been taken "subject to government inspection."

"This doesn't conform," says the inspector. "The specifications say thus and so."

"Sure, but this is our standard make!" is the standard answer.

It is all too common for certain manufacturers to eagerly take a contract with unmistakable specifications, and to squeal like a pig under a gate when the terms are insisted upon. An assistant (just caught) dealing with firms unused to government ways, will frequently hear the indignant comment:

"We have been making broom handles for years, but we never had anything like this before!"

"Another[6] trouble arises in the very beginning from the over-eager sales agent of the manufacturer signing a contract for his firm to supply an article which they have not the appliances for manufacturing. He either doesn't read the specifications, or does not understand them, or else doesn't know exactly what his firm can do."

If a manufacturer must kick—and sometimes he really must—he should do so in advance of work, not after. If a requirement

[6] "Government Testing and Inspection of Material," p. 943.

is bad for him and at the same time not good for the government —for instance, if "Composition G" is specified, and his stock is as good, or better, for the purpose—he can often get authority to deviate slightly from the terms, and thus avoid the annoyance of a rejection.

Complaints as to the requirements and criticism of the specifications are sometimes (not always) hasty and ill-founded. The contractor who frankly charges the government a double price damns "the man who drew up those specifications" without realizing the high standard of excellence required or the special objects in view. He may also fail to see that items seemingly unnecessary are inserted to protect the navy from exploitation by unreliable bidders. The sins of the unfit are visited upon the fit.

Another mistake is to appeal "to high heaven," and not first to the bureau, when provisions are (or seem) incompatible with commercial conditions—when odd sizes or obsolete "mixes" have slipped into the specifications. In such cases manufacturers should "holler and keep a-hollering." But they do not—often from a groundless fear that rivals may gain some advantage from the failure to suffer in silence.

Other ways of some manufacturers tend to increase the cost of inspections. Frequently material is reported ready—and is found to be "near-ready" when the inspector makes his useless trip. This should be cause for a bill from the government. Again, machinery, though seemingly complete, has not been tested by the maker; the inspector's time is taken up with endless adjustments —unless he grows impatient and rejects out of hand. This applies to such items as gauges, steam traps, etc., which may be evidently well made but not yet satisfactory. Preliminary inspection by the manufacturer should be insisted upon. Sometimes when an article has failed, correction is not properly made, and another attempt is made to pass the same defective material. Delay and trouble caused by offering for inspection without previous notification has been referred to above. Of course the inspector can prevent a frittering away of his time by rigid and immediate rejections: but he wishes to cooperate.

In this connection the writer expresses the view that a "noble discontent" in the service and some outside criticism have made the relative efficiency of navy yards seem lower than it is. Observation of successful commercial plants will convince any one that

the yards by no means monopolize defects in management, and that they are in some ways decidedly progressive.

Nothing that precedes should be taken to indicate a lack of friendly relations between makers and inspectors. On the contrary, these relations are usually cordial. The assistant who spends much time at a plant becomes almost "one of the family." Managers, realizing that the inspector is not a free agent, are usually good-natured and courteous. The villain in the play is not the inspector, but an impersonal, dim monster, lurking somewhere in the jungle along the Potomac.

MISTAKES OF THE GOVERNMENT

A contractor sometimes says with "the sincere ring":

"I will never undertake another army or navy job."

To a green contractor, as already said, government work is highly vexatious. He is baffled by "red tape"—by procedures, necessary perhaps, but very unlike those of his other customers. Moreover, "the government" is such an elusive person! Now one man, now another, in a confusing way; also, an inflexible sort of person, meaning what he says.

The imaginary grievances of the manufacturer have been discussed. Some grievances are real. Some specifications, for instance, are still over-severe in particulars, with resulting "toil and trouble" to the contractor (and ultimate expense to the government). The constant effort should be (and is) to eliminate needless tests and requirements. But there are still tares in the wheat—and every dollar spent on useless requirements is a dollar added to costs.

As said above, specifications sometimes (through inadvertence) require special sizes, makes, or material, where standard commercial sizes, etc., would do as well. It must be remembered, however, that what seems "standard" to one maker may seem "special" to others; complaints of this kind require investigation.

It may happen that specifications are unduly (if not intentionally) influenced by the particular practice of one manufacturer. If this occurs it is usually with reason; the lucky firm has given results above the average, or has taken more trouble to explain the good points of its special make. But the result may be hard on some other reliable manufacturer. So far as is consistent with protection from unreliable firms, average practice should govern.

The trouble is that in drawing up specifications it is not easy to separate the essential from the non-essential elements of worth in makes that experience has proved good. Where specifications seem, from this cause, to favor one manufacturer, others may complain—but they must demonstrate. Moreover, even in the case referred to, bids are considered with substitute specifications "slightly different" from those proposed. If a maker uses three screws where the specifications call for four, his bid will be duly weighed and often accepted. So far as the question of favoritism goes, it is a pity that the government cannot, like any private corporation, frankly award its contracts to firms that have "delivered the goods" in the past. It is the unreliable bidder, or the man with poor stuff just within the letter of the specifications, who is really favored.

The manufacturer has a just grievance if the form of specifications and other requirements is such that he cannot readily find and understand them. In the first place, the "English" should be clear and unmistakable. In the second, he should not be forced to refer to several different sheets or pamphlets, or to various parts of the same publication. The best suggestion seems to be that all general requirements, covering cost of inspections, facilities for same, etc., and other matter of a permanent nature, should be in a booklet, while detailed specifications (subject to frequent changes) should be in leaflet form, with a reference to the booklet, and with desiderata that each leaflet should include everything for the material in question and nothing else; should be as brief as possible; and should have captions likely to catch the eye. It is understood that revision along this line is now in progress. If the statement of requirements is at all obscure, busy manufacturers are sure to overlook something important. It is amazing how frequently the plainest letters are misread (by officers and others)—and by no means odd that, in the scramble of business, badly arranged directions are misunderstood. The tendency is towards "our standard" unless the exception is set off with a red flag.

It is a hardship on the contractor if, when an order to a subcontractor or manufacturer fails to tally with the specifications, he is informed of the fault after the work is done, instead of before.

Finally (as said in another connection), it is discouraging to a manufacturer, if his reasonable suggestions do not result in action. "The mills of the gods grind slowly."

TRAINING OF OFFICERS FOR INSPECTION DUTY

Evidently anything tending to cut out errors and misunderstandings is to the mutual advantage of the manufacturers and inspectors. The better informed the inspector is, the more efficient he is, and the more acceptable to the practical people he deals with. A conscientious fool will make more trouble than a conscientious expert. For this reason manufacturers, though fearful of exposing trade secrets, seem quite willing to show inspectors "how it is done."

An officer ordered to inspection duty should regard himself not only as an inspector but also as a student of processes. Inspection trips give good opportunity to compare outside shop practice and methods of management with our own. Between trips an assistant can learn much through discussion, and study enough to greatly broaden his knowledge of mechanical processes. He may even manage to take special mechanical or electrical courses. In Boston, opportunities of this kind are excellent.

Considering the number of officers detailed for inspection duty at navy yards, shipyards, and district offices, it seems plain that some should specialize in work of this kind and be fully trained for it.

The course at the post-graduate department of the Naval Academy, as recently outlined, "should[1] thoroughly fit officers graduating for inspection duty in the branch in which they specialize, and generally for inspection duty along any line."

"In[1] addition to a very excellent course in metallurgy, including lectures by Prof. Walker of Columbia, they individually test and experiment with metals, cement, insulating materials, etc., and should be conversant with the consistency and defects ordinarily found. Also they are taught shop practice, the various, and also the proper, standards of workmanship, the way to measure efficiency of machines and instruments regardless of the efficiency claims of the manufacturers, etc., etc. They have con-

[1] Letter from Lieut. Comdr. J. P. Morton, U. S. N., head of post-graduate Department, Naval Academy, dated February 17, 1913.

siderable to do with the specifications of materials used in the navy, though so far nothing toward the actual preparation."

Following their work at the post-graduate school and the experiment station, student officers will, it is understood, take special courses at Harvard or other civilian institutions, and will, at designated times, make tours of inspection to the big industrial plants of the East.

Of course engineering work afloat is also a preparation for inspection duty. The prospect is therefore bright for a body of inspectors of whom the navy need never be ashamed. The formulation of a sea-going "inspection corps" (within the line, of course) might tend to efficiency and interchangeability. Incidentally it would seem desirable to interchange civilians assigned to any kind of inspection duty (at yards and in districts) with resulting efficiency, convenience, and flexibility. Why should not the inspection personnel of the navy ultimately form one body, with its civilian experts, its officers, and its directing head in Washington?

As an index to the importance of the district inspections, it may be stated that, for the fiscal year ending June 30, 1912, 3,069,188 lbs. of material were inspected by the Boston office—estimated value $906,386.00. The total weight rejected was 44,584 lbs., or about 1.4 per cent. The cost of inspection (exclusive of the pay of officers) was about 1 per cent of the estimated value of material inspected.

It is safe to say that the saving is many times in excess of the cost. Of course the number of civilian assistants should be carefully limited but, considering their great financial responsibilities, they should be highly paid as technical experts and given regular promotion. And the number of officers should be based not only on *absolute needs* but also on a *system of training*.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NAVY YARDS AND THE FLEET

By Lieut. Commander W. G. Mitchell, U. S. Navy

To combat the influence being exerted to bring the operation and control of our navy yards into other hands, it is necessary that the great body of naval officers evince an active interest. Should such a catastrophe occur, the loss to the naval service would be serious and irrevocable.

Under our form of government, the tendency of the times is to shift control of federal activities from military to civil authority.

Every one is familiar with the difficulties confronting attempts to revoke any legislation that has been placed upon the statute books.

Political conditions are such that any governmental branch once under civil control will rarely revert to the military, except in temporary instances when the civil authorities are admittedly unable to control the situation.

An industrial revolution has taken place in the navy yards during the past ten years and the results now being obtained are very satisfactory. These results, however, must not be allowed to lull us into a sense of security. They should inspire greater efforts as there still remains room for improvements.

Navy yard work vitally affects the efficiency of the fleet, and a thorough understanding with resultant coöperation between the fleet and the yards is necessary.

Navy yards exist as an adjunct to the fleet. The more efficient the yards, the more efficient the fleet.

The business organization of the yards and the method of handling work have been gradually evolved and improved until they compare favorably in point of efficiency and economy with the best commercial concerns doing similar work.

There still remain many avenues for improvement, much can be done by the personnel afloat to assist in increasing the efficiency of the yards; this assistance naturally will result in expediting repairs and enhancing the preparedness of the fleet.

The efficiency of the fleet demands that officers understand clearly and that they be thoroughly familiar with the Naval Instructions (Chapter 37) relating to repairs and alterations to ships. A careful perusal of Chapter 30 will also give them an understanding of the manner in which requests for repairs and alterations are handled.

Lieutenant Commander Kearney, eminently fitted by his service afloat and in the Material Division of the Navy Department, has concisely and clearly explained matters pertaining to Chapter 37 of the Naval Instructions in the NAVAL INSTITUTE PROCEEDINGS for September 1913, page 1127, No. 147.

If heads of departments of ships in commission would give thirty minutes to a careful reading of Lieutenant Commander Kearney's article the time would be well spent.

Although the Naval Instructions cover the ground minutely, the results desired are often defeated by the failure on the part of those officers whose duty it is to originate requests for repairs and alterations to carry out the Instructions intelligently.

A common fault is the failure on the part of the ship to supply in advance sufficient definite information to enable the yard to understand just what is wanted in order that preliminary steps may be taken prior to the ship's arrival at the yard.

Delays result until the doubtful points can be cleared up by correspondence and frequently nothing can be undertaken until the ship actually arrives.

Items of work are often stated in general terms or in misleading phraseology. The nomenclature is sometimes incorrectly used. This is a source of error, consequent delay and unnecessary expense for which there is rarely a valid excuse. Ships usually carry detailed drawings or prints which give the necessary information.

In preparing requests for navy yard work, the blue prints should invariably be consulted and quoted, or, if practicable, forwarded with the correspondence. In cases where blue prints are not available, working drawings showing all necessary dimensions and giving specifications in detail, greatly assist the yard force and expedite matters.

The time and labor spent on such sketches is often lost owing to the absence of essential dimensions or data.

Sketches made on board ship should be carefully checked by the most experienced draftsman on board. When drawings are referred to, the reference should be complete, stating the source of the drawing (whether Bureau's or maker's), its title, number, and date of approval.

Data plates on generators, motors, pumps and other machinery often furnish information which, if quoted correctly, may hasten renewals or repairs.

Attention on the part of the ship's officers to such minor details may prove to be an important factor even to the extent of determining whether or not the ship can be made available for duty when her services are required, or on schedule time.

The receipt of accurate advance information is of great assistance to the yard force in the preparation of plans and estimates. It enables officers of the yard to forward correspondence promptly, obtain all necessary authority and make preparations for beginning work upon the arrival of the ship. The most important part is the assembling of necessary material. If the material does not happen to be in store, the receipt of accurate advance information will facilitate the preparation of requisitions and enable the General Storekeeper to procure the material by the time it is needed. The purchase of material usually requires much more time than ships' officers realize. There are good reasons for this. The law requires all material to be obtained on contract or open purchase requisitions from the lowest responsible bidder. This usually causes delay, but the conditions imposed are a great safeguard to the purchaser. Endless accusations of favoritism or of corruption would otherwise result.

The Navy Standard Specifications for Material are another frequent cause of delay in obtaining material. These carefully drawn specifications are essential to the wide employment of competitive bidding. They preclude the demand, on the part of the lowest and irresponsible bidder, for acceptance of inferior material which might be utterly unfit for the purpose intended.

The navy's system of purchase is not unduly slow or complicated and it may convince those who are sceptical as to the necessity for this so called "red tape" to state that the great railroads and other industrial organizations are sometimes more

particular in regard to specifications and rigid inspections than is the navy.

The maintenance of the fleet in fit condition is the principal reason for the existence of the yards and this task can best be accomplished by the men who go to sea and who are thoroughly familiar with the ship and machinery under service conditions. To be thoroughly acquainted with the yard management and the yard workmen is a part of the business of the naval profession.

Under the new conditions the old stigmas of idleness and inefficiency are being wiped out.

The average group of workmen in a navy yard division will not suffer by comparison with a good division of the ship's company or a similar body of men from private yards.

The most valuable asset of a commercial shipyard is a pleased customer. Navy yards strive as hard or harder to please than does the commercial yard. The pecuniary reward is lacking, but the sense of mutual ownership and interest is stronger; the spirit of the service is fundamentally good.

As before stated, the naval officer has the advantage of understanding sea conditions and an officer on duty at a navy yard may be ordered to duty on a ship he has overhauled and stand or fall by the work he did while on shore.

While the ship is refitting at a yard it is necessary that the ship's officers do their part thoroughly. Inspection officers are designated in each department on the ship. It is important that these officers thoroughly familiarize themselves with the spirit of the Naval Instructions in regard to inspection duty. They must study the job in hand in order to understand the various steps necessary, both on board ship and in its progress through the shops. Failure to do this and ignorance of conditions is sometimes a source of friction with the yard force.

The next step is to get in close touch with the yard officials, especially the yard inspection officers, and to work in harmony with them. In doing these things they will learn much of value both in navy yard management and mechanical processes, and it will assist greatly in getting a good job completed in the shortest time at minimum cost.

Inspection officers on board ship must keep in mind that they are the owner's representatives and that it is to the best interest of all concerned to get the best possible work for the money.

The regulations place all necessary power in the hands of the ship's officers to insure getting good work done.

It takes but a few minutes daily to see personally or to talk by telephone with the yard officers in direct charge. Attention to these matters will do much to promote harmony and a warm feeling of mutual interest.

If control of our navy yards passes into civilian hands, it will be a severe blow to the efficiency of the navy. Those who have the welfare of the service at heart must work together with good will for the highest attainable efficiency of the service as a whole, neglecting no part of the establishment.

The maintenance of the fleet is a larger part of an officer's duty than the casual observer realizes.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

DETAILS OF NAVY DEPARTMENT ADMINISTRATION; NAVY DEPARTMENT POLICIES

By Lieut. Commander N. L. Jones, U. S. Navy

The organization, administration and policy of the Navy Department are the subjects of frequent discussion in the Naval Institute Proceedings and in other service publications, but these discussions are usually of a general nature and along broad lines. Officers that have had little duty in the department have often expressed a desire to know the inner workings of the various offices in the Navy Department—"to see the wheels go round," as one expressed it—and this article is an endeavor briefly to describe the central power plant by which the navy is run. The first part of this paper will be found, in even more succinct form, in the Navy Regulations, but it is repeated here as it forms the foundation upon which our naval administration is based.

Council of Aids

Under the present organization of the Navy Department, all naval activities cluster around, and all naval business flows to the Secretary of the Navy through one of the four aids. These aids are without executive authority; they never put their names to papers other than memoranda circulated among themselves, and these memoranda are not forwarded with official mail; yet the aids supervise and present practically all official mail to the Secretary and Assistant Secretary, and give out his approval or disapproval. The only exceptions to this are letters prepared by the chief clerk, the solicitor, and the librarian, and these letters are more legal and historical than naval. Chiefs of bureaus have the right to communicate at any time directly with the Secretary upon bureau affairs, but the official papers prepared as a result of such

interviews must be presented to the Secretary by the appropriate aid.

The aids meet daily in the office of the Aid for Operations and are joined periodically by the Secretary and Assistant Secretary, for the discussion of big naval questions—administrative affairs, legislative measures, and important assignments of ships and officers. Before submission to the Secretary, the Council passes upon:—

Changes in and additions to Navy Regulations and Naval Instructions,

Proposed general orders,

Proposed legislation,

Assignments of rear admirals and captains, afloat and ashore,

General Board recommendations.

The duties of the four divisions are clearly defined in Chapter 2, Navy Regulations: the method of carrying out the work of each will be outlined. The work of the bureaus is so familiar to the service at large that any description of it seems unnecessary.

DIVISION OF OPERATIONS

This division has three officers under the immediate supervision of the Aid for Operations, and their duties are as follows:—

1. An officer in charge of the movements of ships, including orders for the movements of all ships in commission and interdepartmental correspondence, particularly with regard to ship's movements. This includes voluminous correspondence with the State Department in times of unrest in Central and South American waters.

2. An officer to handle correspondence with the General Board, War College, other departments, Navy Regulations, Naval Instructions, general orders, and matters relative to the military features of naval and radio stations.

3. An officer to handle cipher and secret code messages, movements of fuel ships, preparation of signal books and other publications.

The Aid for Operations has supervision over the Naval War College, and the offices of Naval Intelligence, Target Practice and Engineering Competitions.

NAVAL WAR COLLEGE

The president of the War College has eight officers on his staff, and at present there are 19 officers taking the long course. There are now four courses: (a) An elementary course of two weeks in summer for officers of the Atlantic fleet; (b) A preparatory course of four months beginning June 1; (c) the War College Course; this course has been shortened to one year; (d) a correspondence course, now in preparation.

OFFICE OF NAVAL INTELLIGENCE

The Director of Naval Intelligence, who is also a member of the General Board, has seven officers as assistants. Each of these is familiar with some foreign language. The office keeps records of foreign navies with regard to number of ships, personnel, armor, armament, equipment, port regulations, matters of ceremony, salutes, etc. This office is the source of information on all naval matters; is at the disposal of all naval officers, and is not used as much as it should be by officers outside the department.

OFFICE OF TARGET PRACTICE AND ENGINEERING COMPETITIONS

The Director of Target Practice has three officers who assist him in drawing up, in accordance with the "Rules Board's" decision, rules for each form of target practice and engineering competition; in computing scores, and assigning standings to ships. One officer is an expert in engineering, one in turret and broadside battery work, and one in submarine and torpedo work. These officers attend the various practices of the Atlantic fleet in order to get first-hand data for their publications.

DIVISION OF PERSONNEL

This division includes the Bureaus of Navigation and Medicine and Surgery, Headquarters of the Marine Corps, and offices of the Judge-Advocate General, and Naval Examining and Retiring Board. The Aid for Personnel has one assistant in his office. This officer handles mail from the bureaus and offices of the division, inter-departmental mail relating to personnel, prepares disciplinary letters, and reviews general and summary courts-martial, investigations, etc.

The Bureau of Navigation has supervision over the following offices, some of which are of recent origin: Hydrographic Office, Naval Observatory, Radio Service, Naval Districts, Aeronautics, Naval Militia and Naval Reserve.

DIVISION OF MATERIAL

This division includes the Bureaus of Ordnance, Construction and Repair, Steam Engineering, Yards and Docks, Supplies and Accounts, and the Director of Navy Yards.

The Aid for Material has three assistants:

1. An officer who handles all matters connected with the administration and equipment of naval stations; material questions raised by the General Board; inter-departmental correspondence on work done by navy yards for other executive departments, etc.

2. An officer who handles repairs and alterations to all ships, and the material readiness of ships for service.

3. An officer for miscellaneous correspondence, records of repairs, estimates, surveys, requisitions, etc.

In questions affecting more than one material bureau, the Aid for Material arranges a conference of bureau chiefs for the discussion of the points in question. Their decision is incorporated in a letter which is presented to the Secretary for approval by the Aid for Material. This supplants the former method by which bureaus could independently submit recommendations that might interfere with the plans of other bureaus. For instance if in the construction of a ship Steam Engineering wishes to place more power in the engine room, its letter is sent to the Secretary through the Aid for Material. Upon his advice the Secretary refers it to Construction and Repair and Ordnance to see what effect it will have on the ship's draft, arrangement of engine and ammunition spaces, etc. After a conference by the Bureau chiefs, the Aid for Material prepares a compromise, satisfactory to all bureaus, embodying the essential recommendations of each, and it is approved by the Secretary. The co-operation of the Material bureaus has been eminently successful, and the difficult work of this division is most creditably performed.

DIVISION OF INSPECTIONS

The Aid for Inspections has no assistant in his office. His division comprises the Board of Inspection and Survey for Ships and the Board of Inspection for Shore Stations. The former board, whose important and highly professional duties are well known, consists of a rear admiral and eight other officers of rank and ability, including representatives of the Construction, Medical, and Marine Corps.

The Board of Inspection for Shore Stations consists of a rear admiral, two captains, and a naval constructor. This board was authorized in January, 1910, but has done its most important work during the last calendar year, in inspecting naval stations and submitting comprehensive reports upon their general condition, sanitation, accessibility, protection from attack, trend of development, docking and repair facilities, possible extension, etc.

WORK IN THE BUREAUS

As previously stated, the work in the various bureaus is so well known to the service that reference to it seems unnecessary; yet certain subjects have assumed such importance that they require specialists to handle them. The officers in Construction and Repair, Yards and Docks, Medicine and Surgery, and Supplies and Accounts are specialists by virtue of their corps assignment and their training: yet of these corps, the officers best equipped for the specific office duties are selected for certain desks. Navigation, Steam Engineering, and Ordnance, contain line officers who were selected with a view to their fitness to handle the respective duties of personnel, machinery and ordnance.

METHOD OF HANDLING OFFICIAL MAIL

The change in administration in 1909 was followed by so many varying methods of addressing official letters that a plan was conceived of having all mail, of whatever character, addressed to "The Secretary of the Navy," and employing two expert mail clerks thoroughly familiar with mail handled by different offices to forward all mail to its proper destination. This was not adopted, and for months there were complaints of missent mail. One story circulated in the department was to the effect that a quarterly report of a battleship's "operations" had been for-

warded to Medicine and Surgery; another explained the reason for the assignment of the officer in charge of aviation to command a funeral escort on the ground that the deceased was a "high-flyer."

METHOD OF HANDLING DEPARTMENTAL MAIL

The following instances show the track of official letters through the divisions and offices of the Navy Department. It may sound circuitous, but it is comparatively simple and insures full consideration upon every type of letter:

(a) *A Ship Loses a Dinghy from her Lower Boom at Night.*—The commanding officer forwards a "missing" survey, with report of the loss, to the Bureau of Construction and Repair direct. The Bureau orders the shipment of another dinghy to the ship; and, not being satisfied with the care exercised over the old dinghy, forwards the survey to the department (Material) for appropriate action. The Aid for Material sends it to Personnel by memorandum recommending disciplinary action. Personnel stamps it to Navigation, which is charged with disciplinary action. Navigation returns it to the department (Personnel) with a letter of reprimand to the officer of the deck charged with the loss, and with a copy of the letter to be filed with his record. The Aid for Personnel has the letter signed by the Secretary and returns the report of survey to Material by memorandum stating that disciplinary action has been taken. The Aid for Material stamps it to Construction and Repair for information and file.

(b) *An Additional Gunboat is Needed in Mexican Waters.*—Operations informs Material and Personnel by memorandum and inquires when gunboat *X* at the Portsmouth Navy Yard can be ready for sea. Material telephones it to C. and R., Ordnance, S. E., and S. and A.; Personnel to Navigation, and to the Marine Corps if marines are to be furnished. Navigation, in turn, telephones the Hydrographic Office and Naval Observatory. All bureaus and offices thus notified report when repairs will be completed, crew furnished, and supplies, compasses, charts, etc., on board. The department (Personnel) issues an order placing the ship in commission, notifying Operations and Material by memorandum. The department (Operations) then issues sailing orders and informs all offices by printed circular.

(c) *The Bureau of Steam Engineering Desires the Reservation of Certain Oil-Bearing Lands for the Use of the Navy.*—The

bureau officer in charge of this makes a careful study of the navy's need and of the situation, consulting experts of the big oil companies, the Bureau of Mines and the Geological Survey of the Department of the Interior. The Chief of Bureau informs the Secretary of the result of this officer's work, and the Secretary arranges a conference with the Secretary of the Interior, Directors of the Bureau of Mines and Geological Survey, Aids for Operations and Material, Chief of Bureau of Steam Engineering and his expert officer. The recommendation or agreement of the conferees is forwarded to the General Board (via Operations) for consideration, comment and recommendation. The General Board's recommendation, for lease, purchase, or otherwise, is returned to the department (Operations) and presented to the Secretary with the approval of the Council of Aids, and the solicitor is directed to prepare a provision for submission to Congress embodying the approved recommendation. This provision is forwarded by the Secretary to the Senate and House Naval Committees.

There are of course innumerable variations of these examples: questions may be settled by the Secretary direct; the General Board may consider questions before they reach the stage of investigation, or may even initiate the inquiry; but the above examples illustrate the care with which mail, affecting more than one office, is handled. The bureaus and offices handle directly with ships and yards all requisitions, surveys, requests for stores and supplies, and other matters delegated to them by statute law and the Navy Regulations.

NAVY DEPARTMENT POLICIES

The Navy Department has certain principles, methods and aims upon which the transaction of its business is based, and the "policy of the Department" is well understood by the officers of the Department, although there is no formal announcement of these methods, or of changes in them.

The following policies are in effect:

1. Sea Duty

Naval officers eligible for sea duty must have had sufficient duty afloat in each grade in order to qualify for promotion.

Shore duty beyond seas at Guantanamo, in the Philippines, at Guam and Samoa counts as a cruise, but does not count as sea duty. The period of shore duty at these places should not be longer than two years; the remainder of the three years to be spent on board ship. Shore duty beyond seas at other places than these mentioned does not count as a cruise.

Commanders-in-Chief:—To be selected from flag officers who have served not less than one year as a division commander in the fleet, and who have still not less than three years to serve. Commanders-in-chief when relieved to be eligible for assignment to duty on the General Board, and if they have still not less than two years to serve on the active list, as Aid for Operations.

Division Commanders:—To be selected from flag officers who have not less than three years to serve on the active list.

Flotilla Commanders:—To be a flag officer as young as practicable, or captain, and to be selected from those officers, who on account of age and their qualifications, may be in line of advancement to division commander and commander-in-chief.

Chiefs of Staff:—To be detailed by the department from captains who have made a battleship cruise, and have had *War College* experience. This detail should *not be considered a personal* one, but the officer should be selected by the department and assigned to this duty. In case of two or more officers being equally well qualified for the position, the commander-in-chief should be allowed to select. The above applies only to fleets of capital ships composed of one or more divisions.

Captains:—In a short time all captains will have to make a second cruise as such; therefore, junior captains should be assigned to the less important capital ships as soon as they are promoted and their services become available; their second cruises to be in command of the more important capital ships, or as chief of staff of an active fleet. Captains to be assigned to command of ships under construction to be detailed as inspectors of such ships six months before commissioning, if practicable.

Commanders:—Commanders in their first cruise will be assigned to duty as executive officers of capital ships in the active fleet as part of their cruise (not less than one year) and then to command of gunboats, small cruisers, repair ships, etc., in full commission, or to the command of a capital ship in reserve.

On second cruise commanders will be assigned to command cruisers in full commission and battleships in reserve.

The length of a commander's cruise will be approximately two years. They should have at least eighteen months at sea before promotion. Commanders will be assigned to command divisions of destroyers and submarines in the future.

Lieutenant Commanders:—Supply vessels will be commanded by lieutenant commanders.

Selections for commands for destroyers will be made from lieutenant commanders, or from lieutenants near promotion. As many officers as possible should be given experience in command of destroyers. The period of destroyer command should be about two years.

Lieutenants:—Lieutenants will have an average of three years at sea and two years on shore. Lieutenants, junior grade, may be assigned to the postgraduate course after five years at sea; after six years they may be assigned to other shore duty.

Ensigns:—Ensigns should be assigned to capital ships in the active fleets for the first two years after graduation. The most proficient may be considered available for assignment to other vessels after a year at sea if shown by their official records to be qualified for watch-standing duty.

Younger officers' duty will be so rotated that they will gain the different kinds of experience.

Duty on gunboats will be, as far as possible, limited to one year for the younger officers.

Selections for Command and all other Important Duty:—Selections for command and all other important duty should be made after close scrutiny of the official records of the available officers, having regard for special fitness as shown by these records.

2. DEVELOPMENT OF THE NAVAL WAR COLLEGE

The increase in the number of officers taking the War College Course, the change in this course to one year, and the introduction of a Correspondence Course in which all officers must qualify, constitute a departmental policy of recent adoption. The interest of the Secretary of the Navy in the War College is so strong that he feels that every officer should have a course at that institution before assuming command of a ship; and the experience of

cruiser and gunboat commanders in southern waters have proven the advisability of this.

3. Development of Naval Aeronautics

The department is committed to the advancement of both academic and practical aeronautics in the navy. An officer skilled in the principles and technicalities of aeronautics is charged with the academic part, which includes the ultimate establishment of an aerodynamic laboratory for scientific investigation; another officer has the supervision of all practical instruction in aviation, and divides his time between the department and the aviation base.

4. Extension of the Radio Service

The Navy Department has consistently stood for the control of high-power radio stations on both coasts and the extension of our radio system across the Pacific to Hawaii and the Philippines. The establishment of a high-power station in the Panama Canal Zone is progressing rapidly, and a smaller station with 300-foot towers is being constructed at each terminal, to handle ships coming in from sea and going through the canal. A connecting link between Arlington and Panama, Key West and San Diego, will be erected at Point Isabel, Texas, which will ensure steady communication between those points in any condition of static. When the high-power chain has been established across the Pacific, the Navy Department will be in constant touch by radio with the men-of-war in Asiatic waters. Experiments are under way to test the different types of radiophares by which a lightship may give a ship within radio distance her bearing from the lightship in any weather.

5. Acquisition of Coal and Oil for the Navy

In co-operation with the Department of the Interior, the Navy Department is investigating certain coal lands in Alaska with a view to having them reserved by Executive Order for the exclusive use of the navy. Congress has been asked for an appropriation to enable the department to acquire a lease of oil-bearing lands in Oklahoma; the reservation of certain oil-lands in southern California for naval use has been made, and the litigation in connection with this reservation is being handled by the Department of Justice.

6. "SAVING MONEY AFLOAT TO PUT IT ASHORE"

This policy was inaugurated by the present administration. In economizing ashore, money previously appropriated but not used, has been diverted to more necessary uses afloat. For instance, money amounting to $671,819.00 was saved from appropriations for public buildings, barracks and hospitals, while the savings on armor plate, forgings, turbine drums, and other steel work, amounted to $782,117.00. The saving on projectiles due to competition from England and Germany, and consequent competition in this country, amounted to $1,068,750.00. These amounts saved were considered in estimating upon appropriations for the Navy afloat.

7. GOVERNMENT MANUFACTURE OF GUNS, POWDER, TORPEDOES AND ARMOR

In connection with the economy effected in saving ashore, the department desires to cut down the current expenses of the navy still further by the manufacture of armor plate, guns, powder and torpedoes. This policy does not contemplate their immediate manufacture exclusively by the government, but in such proportion as ensure bona fide competition and fair prices among outside competitors.

8. EDUCATION OF ENLISTED MEN

The policy with regard to the educational system for enlisted men is described in General Order No. 63, of December 16, 1913. To carry this out successfully, it is believed that the instruction of the men can best be given by the younger officers who have their Naval Academy training fresh in mind. With this in view, arrangements will be made to have professors and other educators address the midshipmen of the senior class on the methods that should be employed in this work. The department is endeavoring to uplift the enlisted personnel by giving them an opportunity to qualify for promotion to assistant paymaster, and, in the case of warrant officers, to ensigns.

A broader way for the promotion of enlisted men is proposed in the legislation now pending, whereby 25 enlisted men who have served not less than two years in the Navy may be appointed as midshipmen to the Navval Academy after such competitive mental and physical examinations as the Secretary may prescribe.

The navy's complement of enlisted men has been completely filled during the present administration, and this has been due to:

(a) the educational system, in which common school and vocational education is furnished every enlisted man in accordance with his aptitude,

(b) the better chance of promotion, and the opening of avenues to promotion to commissioned rank; and,

(c) the cruise of the fleet to the Mediterranean, and the opportunity for men to see more of the world.

9. INCREASE OF CHAPLAINS

The pending Naval Appropriation bill contains an increase in the number of chaplains from 24 to 52; it authorizes acting chaplains to serve three years at sea, after which they shall be examined by a board of chaplains and medical officers for mental, moral, professional, and physical qualities to perform the duties of chaplain. The Secretary will nominate young men specially trained and with love for service afloat; and regardless of their ability as a minister in civil life, will retain only such acting chaplains as have shown their adaptability and love for the naval service, and their aptitude for helping and encouraging the personnel.

10. MORALE OF NAVAL PERSONNEL

The department desires officers and men of clean, wholesome, temperate lives, and will not condone offences of dishonesty, intoxication, or scandalous conduct. The moral standard of the Naval Academy is rigidly upheld and a midshipman who tells an untruth, is guilty of hazing, drinking, or unofficer-like conduct, will be promptly dismissed.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

PRINCIPLES OF NAVAL AERONAUTICS[1]

By the late NAVAL CONSTRUCTOR PIETZKER, Imperial German Navy

Translated by LIEUTENANT G. M. BAUM, U. S. Navy

(*Marine Rundschau*, October, 1913.)

I. GENERAL

The general usefulness of airships has been demonstrated. The deplorable loss of the *L 1* brings up discussion as to their utility for the Navy.

Naval airships should serve principally for scouting.

They are especially qualified for scouting at sea, inasmuch as, contrary to the conditions over the land, there is no possibility of hiding at sea, and the deceptions that trees, villages and the like can offer, are excluded. A slight elevation over the surface

[1] EDITOR'S NOTE.—The United States Navy has done nothing so far in regard to dirigibles other than to convene a special board on aeronautics in December, 1913. This board recommended in their report that dirigibles be purchased at an early date. (See page 261, PROCEEDINGS, Whole Number 149, Jan.-Feb., 1914.)

This article (translation) was written by a naval constructor of the German navy, who was actively associated with the development of naval dirigibles; he lost his life in the *L 2* disaster. As the Germans lead the world in dirigibles, it would seem well to seriously consider what Naval Constructor Pietzker has to say about them.

The Germans have met with accident after accident in their attempts to develop the dirigible into a practical and reliable vehicle of the air. The many Zeppelin dirigibles have all been wrecked and the naval Zeppelins have met a like fate; the *L 1* foundered in a gale near Helgoland late last summer (see illustration of *L 1* in frontispiece); the *L 2* caught on fire and blew up during her acceptance trials on October 7, 1913. (See page 265, PROCEEDINGS, Whole Number 149, Jan.-Feb., 1914.)

of the sea decidedly increases the range of vision. The visible horizon radius is:

Height	Radius
50 m	23 km.
100 "	33 "
200 "	47 "
500 "	74 "
1000 "	104 "

Naturally, this total field of vision will not always be available. Foggy or hazy weather reduces it. But on clear days, this vast field comes fully into view. What this means in a military sense need not be inquired into further. It is clear that such scouting may be of great importance in operations, since it can not be easily interfered with by the enemy.

In order to be able to perform this service, the airships must possess the technical ability to undertake over-sea trips under war conditions with sufficient safety in such a number of days that their employment will not be the exception but the general rule, even though it is not to be expected and not to be presumed that the duty assigned can be accomplished under all circumstances. The radius of action shows the principal difference as compared to the employment over land, because at sea the fighting forces move much more quickly and any intermediate landing of the airship is out of the question.

We had best analyze their ability to perform these services from two points of view. First, are airships in general "capable," under normal conditions, and does the status of aerial navigation permit in other respects? and second, do not the special dangers and sources of accidents represent too great a reduction of their ordinary usefulness under normal conditions?

II. Ability Under Normal Conditions.

Extended over-sea trips under war conditions require in addition to general utility for aerial navigation:

1. The practicability of carrying on board a sufficient quantity of fuel for long trips, and of ballast necessary for altitude flights; sufficient certainty of the operation of the engines; a speed which enables them to make headway even in a strong wind and even when flying against the wind; equipment with searchlights, machine guns for repelling aeroplanes, and a radio

set, which is indispensable for sending out military information and receiving weather reports and adds to safety; finally, the practicability of carrying a double crew (2 watches) so that on long trips the crew may have a relief, as well as sufficient comfort so that the watch off duty can recuperate.

2. Points not directly connected with the ship:

(a) Perfecting of the hangars so that the running out from the interior is possible in all winds in which the airship can travel.

(b) A meteorological service which will guarantee that a trip is started only in such weather that the return can be assured and that too strong contrary winds will not be encountered.

(c) The possibility of sufficient orientation.

The extent to which these points are already realized is pointed out briefly in the following:

1. The Development of the Ship.—It is evident in advance that the increase of the requirements as compared to ordinary air travel, must lead to large displacement, that is, large gas space, of airships. The weights of building material of the hull which are useless in other respects but can not be dispensed with, and of the machinery necessary to attain a specified speed, do not increase in the same ratio as the displacement but in a lesser ratio, so that with an increase of displacement, there is unused lifting power available for increasing the efficiency. The performances expected require so much weight and displacement that the adoption of non-rigid airships for the navy is out of the question for the time being, since in them the large displacements are not yet practicable, and they are still confronted with great difficulties. A principal advantage of the non-rigid airship almost entirely disappears also with increase of size, namely, the lightness of the hull for the displacement, and its other advantage, easy demountability and transportability by railway, is no attraction for the navy. Therefore, only rigid airships enter into the question.

In general, the basic principles for the carrying power of airships are little known and are therefore briefly set forth in the following:

Inasmuch as the airship floats and must therefore first rise in the air on departure, the lifting power of its gas volume must be a little greater than its weight. The weight is made up of dead weight (weight of building material and permanently installed or necessary equipments, for example, radio, searchlight, anchor

gear), and loose cargo, ordinarily called the useful load (crew, supplies, fuel, ballast). The total of this variable, useful load, which can be carried at one time depends upon the amount of the lifting power on departure, which varies and may be of very different amounts. The lifting power is equal to the weight of the displaced air, less the weight of the gas contained in the cells. The weight of the air is directly proportional to the barometric pressure, inversely proportional to the absolute temperature, varying slightly according to the moisture of the air. The weight of the gas (hydrogen) depends practically on its grade of purity or its mixture with air, which is essentially a question of the practical handling and the quality of the fabric of the cells. How great the difference may be under conditions that are likely to occur in practice, is shown by the following comparison:

1 cubic meter of gas space represents a lifting power:
of 1.22 kg. at 770 mm. barometric pressure, −10°C.,
specific weight of the gas 0.1, and
of 1.01 kg. at 740 mm. barometric pressure, 20°C.,
specific weight of the gas 0.14.

What the airship can carry on departure depends on these figures. During the flight, a great change in the conditions takes place. The airship travels, not like a submarine with practically uniform propulsion, but the weight and the lifting power change so that the changing conditions of the trip may be entirely different. The weight diminishes through the consumption of fuel and increases in conditions of rain or snow, whose added weight may reach 1000 to 1500 kg. The lifting power of the gas decreases through the diffusion of the gas through the cell walls which, however, does not amount to a great deal practically, and secondly, through the blowing off of the cells through the valves. The capacity of the cells is fixed and can not increase through elastic expansion of the cells because these are already small and are, above all, limited by the framework against which they press. When the gas expands, some of it escapes through the valve and is lost. When the cause of the expansion ceases later and the gas again contracts, the cells are left only partly filled. The unfilled portion, in the meantime, loses in weight of gas and lifting power. Making up for the escaped gas by carrying along reserve hydrogen, etc. is out of the question in practice, since the weights necessary for this are greater than the advantages to be obtained. The causes for the expansion of the gas are:

(a) Ascending to greater altitudes. An ascension of about 80 to 100 meters represents a reduction of the outside pressure of one per cent, resulting in an expansion of one per cent of the gas, The value to be inserted for the calculation of the loss of gas, will be strongly influenced by the mixture of the gas with air. The airship does not regain any of its lost lifting force by reducing its altitude. It comes into heavier and more buoyant air strata causing the gas to contract and occupy a reduced volume; the product of pressure and volume remains constant.

(b) Increase of the gas temperature. One degree represents an expansion of about 0.36 per cent. The rise in temperature depends first on the different heat strata of the air in which very unusual reverses of the ordinary strata are possible, and whose influence can not be followed here in detail, since it depends on the rapidity with which the gas temperature follows the air temperature. It thus makes a whole series of combinations possible.

Secondly and principally, it depends on the rise in temperature of the gas due to the influence of the sun's rays (up to about 15°C.) as compared to the surrounding air. The loss in buoyancy becomes effective as soon as the gas again cools off, after the sun's rays have been cut off (clouds, night). In unusual circumstances, when the cells are not fully inflated beforehand and the expansion due to the temperature does not necessitate blowing off the gas cells, the heating by the sun's rays can cause a temporary increase above the lifting power at an intermediate stage of the flight (however, not above the conditions at the beginning of the flight). In general, however, it is only the cause of the loss of gas, as in rising in altitudes, that is brought out.

Should this loss (near the end of a long trip) balance the lightening of the load due to the consumption of fuel, then it has no effect. If this is not the case, however, as at the beginning of a trip, then the balance must be established dynamically by the use of the altitude rudders. This dynamical operation is considerable in still air conditions; for an airship like the *L 1* it can amount to from 1500 to 2000 kg.; it will be substantially reduced when the squally air structure causes differences of velocities of separate air strata and suddenly produces loss of its supporting quality (the famous air pockets of the aviator) or when the ship answers the rudder badly. If the dynamic power is no longer sufficient, or if a landing must be made (at the

stopping of the engines the dynamic power naturally ceases) then sufficient ballast must be thrown overboard. Herein lies the principal function of the ballast. Aside from this it temporarily aids in steering when making a landing. Only water can be considered as such steering ballast; the fuel must be drawn on to furnish the large amounts of ballast to be given off in high altitude flights, since the great weights necessary can be obtained in this way only; later on in the discussion of the vertical currents, this will be gone into more fully.

How different the conditions may be, is shown by the two following examples of a flight of the *L 1* in mean conditions (height of barometer 760 mm., temperature 10° C., specific weight of the gas 0.125). At the beginning of the flight (after 3 hours) the ship was compelled to at once seek an altitude of 1000 meters on account of a simultaneous higher gas temperature of 12°C.; on the second occasion, not until toward the end of the flight (after 30 hours) without a simultaneous increase of gas temperature. In the first case, the loss in lifting power is 3600 kg. against which the weight reduction in fuel consumption is only 360 kg.; thus there arises a total loss of about 3200 kg. in lifting power. In the second case, the loss in lifting power is 2500 kg., and corresponding to this we have a lightening of 3500 kg. in fuel consumed. Thus there remains a lifting force of 1000 kg.

From these examples it is seen that the seeking of greater altitudes is undoubtedly practicable under certain circumstances; however, such altitudes require too much of the weights provided as ballast, and are therefore not compatible with the amount of fuel that must be carried for long flights. Therefore, it must be remembered that the altitude flight, the travelling at a so called battle-altitude, is not nearly so necessary for the navy as it is for the army (which, moreover, needs only shorter flights). In army operations, the enemy may be hidden in any forest, or in any village, firing upon the airship, and in clear weather conditions the ship must be able to avoid these dangers by flying at high altitudes. At sea, except in case of a fog, the airship will sight the enemy in sufficient time to be able to make use of its speed when rising to a higher altitude is too difficult.

The two following examples will show how the carrying capacity of the *L 1* was apportioned under different conditions in

accordance with these foregoing principles, if we disregard the possibility of making an altitude flight at any moment:

		Under very favorable conditions: Barometer, 770 mm.; temperature, −10°C.; specific weight of gas, 0.1	*Under very unfavorable conditions:* Barometer, 740 mm.; temperature, 20°C.; specific weight of gas, .014
Carrying capacity		27,518 kg.	22,635 kg.
Dead weights:			
Ship with permanent installations	16,372 kg.		
Searchlight with power plant	314 "		
Radio outfit	210 "		
Equipment	960 "		
Crew of 17 men with effects and provisions	1 870 "		
12 ballast bags, about 80 kg. each	960 "	20,686 "	20,686 "
Therefore there remains for fuel and oil		6,832 kg.	1,949 kg.
Supply of fuel lasts in hours, using one motor		171 "	49 "
Supply of fuel lasts, using two motors, in hours of flight		85½ "	24½ "

The foregoing shows clearly that the carrying capacity of the *L 1* was capable of the prescribed requirements of lifting power, and that the airship was qualified for military work. At the beginning of the development, the navy was already satisfied that only airships of large displacement could be considered for employment over the sea, and had therefore ordered the construction of the *L 1* to be decidedly larger than any previous airships, in fact, as large as it was then possible to build at the construction plants. Thus the *L 1* had a capacity of 22,500 cubic meters as compared to 19,000 of the ships of that time. It was believed that the construction plants could not exceed this. In later ships it was found possible to exceed this; the *L 2* has a capacity of 27,000 cubic meters and the following ones will be still larger. However, the progress must be gradual and not in too large single steps, since two considerations are opposed to too large single advances. First, the security of the framework can not be obtained entirely by calculation, but in addition to the calculation, trials and careful subsequent building on the basis of tested construction are involved, since on account of the lightness, it is necessary to use much broader breaking limits than is

otherwise customary. One obtains an idea of what has been accomplished in progressive construction when one recalls that such an airship has a capacity equal in size to that of an average warship and a weight of material equal to that of one of the larger ship's boats. Secondly, the increase in the size of airships, with which arises increased difficulty of handling them on land upon landing and departure, forms an important point because in these maneuvers, the airships are tended principally by hand; the extent of our progress in this must likewise be developed step by step.

After this principal subject of carrying capacity, come the remaining requirements previously stated.

The reliability of the motors has been perfected lately by the Maybach Motor Factory at Friederichshafen and brought to a high grade of efficiency. The motors are given a shop test of 6 hours uninterrupted operation. However, uninterrupted operation of the motors lasting 12 and more hours has actually taken place in airships without any mishap. That entirely suffices since, as a rule, a motor is occasionally disconnected and looked after.

The greatest speed of the *L 1* was about 20 meters per second. In the practical endurance run, when it was reduced by the shifting of the rudders and the canting of the ship, it was somewhat smaller. Practical experience shows that in most days of the year, this speed suffices, so that a fixed destination can be reached with certainty. These practical experiences of airship flight thus give a clearer idea than various tables of prevailing winds and the like, since these do not ordinarily give the individual strength of the currents and, generally, no clear idea of conditions favorable for airship flight is given. The *L 2* has a still greater speed, about 22 meters per second, and further increases will follow.

The equipment with searchlights and machine guns presents no difficulties. It can be so arranged that the open flame occurs in places where none of the gas can enter. This is a little more difficult with the radio outfit, but even so, the problem is practically solved. The operation of the power plant is possible without endangering the ship; only a few minor questions remain to be cleared up in this. The radio is furthermore one of the essential parts of the ship, partly because of its employment in scouting and partly because it is needed to receive orders and weather notices.

2. Status of Air Travel Aside from the Ship Itself.

(a) The question of sheds. Until recently, this was the principal cause for the restriction of the employment. The rigid sheds used almost exclusively up to the present time, allow the running in and out of the airship only in winds parallel to the shed, while cross winds of only moderate strength make it impossible. Various means have been tried to remove this evil; broadening the sheds, using cars to which the airship was secured and run out; but all such arrangements signify only a limited increase of safety, especially since the cars for which the laymen promise much and for whose mechanical structure many proposals have been submitted presupposing a complete utilization of the strength of the airship's framework which will not be attained for some time to come. Aside from this, even under favorable conditions with the wind blowing parallel to the length of the shed, it is still possible that the airship may be in the shed with stern to the wind, and must be run out thus. In this case, it must be turned around in order to take its departure, because it can take its departure with the wind only under great difficulties. The turning around thus necessitated is a dangerous operation even in a moderate breeze.

Lately, and in fact through the lead taken by the Admiralty, this difficulty has been almost entirely removed. In the navy installations, and in addition, in all the future installations, revolving sheds, which can at all times be turned into the wind and out of which the airship can be run safely in any wind in which it can possibly fly, will be provided. The question whether it is really more advantageous to build single revolving sheds, double revolving sheds, or a combination of a shed with fixed foundation as a storehouse with a revolving shed to be used as a slip, is still to be cleared up.

(b) The weather forecast. A whole series of organizations which will furnish the weather forecast for the practical airship service with increasing frequency has been provided and still more will be provided. Even the science itself is becoming more and more developed through aeronautics, which has decidedly broadened our knowledge and continues to do so daily. On the other hand, one must not rate the weather forecasts based on weather reports from all stations too highly in their significance in war. For this purpose there must be, in addition, as complete

a development of pilots in judging weather conditions as possible, conditions which they themselves can observe; in this field also, constant progress is noted.

(c) Orientation. Orientation over the open sea with unknown wind conditions which make dead reckoning impossible, still presents difficulties in foggy weather and on days when two simultaneous astronomical observations are impossible. This condition, however, is not an absolute hindrance, since in most cases an approximate plotting of the general bearings is possible and there are already encouraging attempts under way to make orientation possible at all times.

The general outlook of the normal conditions shows that the present day airships are in a position to commence fulfilling the prescribed requirements, and that they are therefore practicable for the navy. It is conceded that they are very dependent upon the weather and that they cannot always accomplish flights at high altitudes; the scouting service performed by them will be looked upon as supplementary to the ordinary means of scouting, and to dispense with any of these other means of scouting in any way would signify a misunderstanding of the actual conditions; but the value that the airship can have under certain circumstances is so large, it can have such decisive significance, that its employment is required in spite of this. The further development must, above all, lead to larger displacements gradually, since it must include the radio station, the meteorological improvements and the orientation. Development is in full progress in all these lines.

III. The Special Dangers of Air Flight

The normal ability of airships will be strongly influenced by the special dangers. For this reason, a special examination must be made to determine if they influence the conclusions drawn in II.

1. Storms.—As long as we consider the word "Storms" to signify strong winds in a horizontal plane, as is generally accepted, they represent a small danger. Such weather conditions can generally be recognized in advance with certainty as shown by the long past record of the storm signal-service on the coast. Should the airship, in spite of this information, get into a wind to which it is not equal, then under certain circumstances its non-

arrival in port may result. In this respect conditions are becoming continually better due to the increasing speed of the airships and the increasing number of sheds.

2. Vertical Currents.—The vertical movement of the air such as came up strongest and most fatally in the storm-like, passing squalls which brought about the destruction of the *L 1* is actually one of the greatest dangers of aeronautics. In extreme cases, as for example in the case of the *L 1*, it can render the steering gear useless, and it represents a great danger under all circumstances inasmuch as it can blow the airship to such an undesired altitude as to cause great loss of gas. I have stated previously that the flight at high altitudes is one of the chief difficulties and can not always be accomplished. Therefore it is clear that an undesired altitude under unfavorable circumstances may have serious consequences. The chief remedy is naturally the carrying of as large a weight of ballast as possible in such a form that it is possible to release it. Solid weights for this purpose enter the question only slightly as compared to the large amount of fuel. It has been tried—and it will be still further developed—to make it possible to throw overboard the greater part of the fuel supply, that is, the explosive fuel, in addition to a certain amount of water ballast which must remain on hand to assist in steering when landing. This has been done by the *L 1* and has been carried out to a further extent by the *L 2*. Naturally, one cannot carry this too far, otherwise the operation of the main engines is impaired or made practically impossible; a certain amount of reserve fuel must remain on board to develop the doubly valuable dynamical power in case of a squall and to resume the flight after it is over. The aim of the development which, as already stated, can take place only gradually, must be to construct the airship with sufficient ballast from the very beginning so that it will have sufficient excess fluid weight on hand for even the most difficult weather conditions. For the time being we must still make it a rule to avoid the possibility of encountering heavy squalls. If the squall cannot be avoided, it is necessary to ride it out at as low an altitude as possible where the air currents are horizontal and the danger of being blown to a higher altitude is reduced. Above all, however, the increase of the displacement presents the best solution because, even though it carries with it a greater loss of gas at high altitudes,

the increase of carrying capacity is still greater, and with its increase, the efficiency of the machinery and dynamic power also grows, enabling the airship to prevent descending.

3. Thunder Storms.—A large part of the dangers from thunder-storms is covered by the previously discussed dangers due to vertical squalls inasmuch as thunder storms are full of such squalls and the squalls nearly always have a stormy character. The danger from lightning has not yet been cleared up. As we proceed, this seems smaller than was at first believed. Probably the framework of the airship furnishes an excellent conducting medium for this electrical phenomenon. The charging of the airship itself is made difficult by the exhaust gas and by the propeller tips, which are very good discharging mediums.

4. Fire and Ignition Danger.—Unfortunately, hydrogen is the only gas that up to the present time is adaptable. It is very inflammable as soon as its presence in air exceeds 9.45 per cent. Thus an explosion follows ignition up to a percentage of 66.4 (oxyhydrogen). For this reason all unscreened fire must be excluded from all parts of the ship where hydrogen may be present. This question is solved for the installation of motors, machine guns, searchlight, and radio. There still remains a certain danger in accidents to the ship in which sparks can be caused by breaking metal, and perhaps in still another way, for example, when there is a great deal of friction of balloon fabric. This matter still requires a final clearing up, in which the navy is zealously cooperating. Most probably, these conditions can not come up while the airship is in the air, but only when it is on the ground, in which case the scope of the danger is decidedly reduced.

5. The Frailness of the Framework.—It has been previously stated that the ordinary requirements for strength could not be made of the framework of an airship. This becomes uncomfortably apparent in maneuvering the ship by hand on the ground, and in addition, when lying at anchor in a storm. In the meantime the resistance continues to increase with the increase of the displacement, for which more weight for solid fittings and the principal parts coming under observation is continually required.

6. Special Conditions in Over-Sea Flying.—Contrary to the flying over land, for which the conditions can now be generally considered as cleared up, the flying over-sea has been tested very

little up to the present, and it is not as yet possible to make any definite statements regarding it. On the one hand, the uniformity of the lower stratum is, as a rule, constant and thus provides good wind conditions from the aeronautic point of view; on the other hand, however, it is certain that the long flights necessary, and the impossibility of an intermediate landing, both lead constructively to large displacement, as previously stated; they will also present new problems in the science of airship flight. Presumably the time will soon come when the experiences derived through over-sea flights will influence construction favorably for them; to this end, as much flying over-sea as possible must be done in a gradual progression of performances.

CONCLUSION

Finally, as the result of the analysis of these particular sources of danger, it can be said that even they do not suffice to upset or in any way change the opinion which would be formed of the ability of the airship under normal conditions. It has been more clearly brought out that the efficiency of the airships is very dependent on the weather and that conditions may arise in which the airship is not equal to the weather. However, as we failed to come to the conclusion to dispense with naval warfare in the days of the sailing ship, when even frigates were not equal to all storms, so little may we say that the existence of certain dangers justifies dispensing with the development of a weapon which is progressing to full efficiency and can then render great service. The points which come under observation for a methodical development, and the approximate lines which this must follow, are discussed separately in the foregoing. Intensive work is being done on all these points, and there can be no doubt that the safety will be decidedly increased in the extremely rapid technical development to which we are nowadays accustomed in all services.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

CONCENTRATION OF FIRE AND THE NUMERICAL STRENGTH OF A DIVISION

By COMMANDER ROMEO BERNOTTI, Italian Navy

Translated by LIEUT. (jr. grade) C. C. GILL, U. S. Navy

AND

A. F. WESTCOTT, PH. D., Instructor, U. S. Naval Academy

TRANSLATORS' NOTE.—This analysis, prepared by a well-known Italian naval tactician and appearing in the official organ of the Italian General Staff, may be taken as the product of experience gained in the recent trouble with Turkey, combined with the careful study and original research for which the Italian Navy is distinguished.

Whatever its intrinsic value, it merits the attention of naval officers as an example of the way in which the Italian General Staff indoctrinates its personnel with the underlying reasons for the adoption of a definite plan of fleet organization and training. While it is not a mere mathematical trick demonstration, nor yet a speculation on long accepted general principles, the article is noteworthy for its mathematical precision, logical sequence, and conformity to accepted theories in dealing with a very practical question.

The hypotheses demonstrated are:

1. The most efficient concentrating group is two ships.

2. The division should consist of two concentrating sections, and should ordinarily maintain the conventional column formation.

3. A squadron should consist of two or at most three divisions operating individually but with unity of control and unity of action. (A larger number of ships should form two squadrons maneuvering independently but coordinately.)

The elemental subdivision (*reparto elementare*) of a naval force may be taken as that number of ships which are primarily designed to fire at the same target. For example, this elemental subdivision, or concentrating group, will consist of one ship if each ship fires at a separate target; or of two, three, or four ships, if groups of such respective numerical values concentrate their fire.

The first question to be considered is: What is the proper numerical strength of this elemental subdivision? Or, in other words, how should a fleet be divided into concentrating groups in order to secure maximum effectiveness of gun-fire?

The motive for concentration is based on the axiomatic principle that gun-fire should be so controlled as to secure a decisive advantage in the minimum time.

At first glance, it might be supposed that the effectiveness of fire would increase in proportion to the size of the concentrating groups; for it seems plausible that the larger the concentrating groups, the more quickly would their attack produce tangible results. One might infer, therefore, that in the case of two opposing forces, consisting of an equal number of ships similar in type and equal in unit offensive power, the one with the larger concentrating groups would the more readily destroy the balance of numerical equality, thus securing both material and moral advantage.

But increasing the number of ships in the concentrating groups necessarily decreases the number of target ships, and thus leaves a larger number of enemy ships free to fire undisturbed by hostile attack. This point is important, for the effectiveness of a ship's attack varies inversely with the effectiveness of the attack to which it is exposed. This compels attention to the fact that if a concentrating group of a given strength is sufficient to get decisive results in a relatively short time, then a larger concentrating group would be a wretched tactical disposition of forces.

Here it may be noted that in past years, when engagements at long range first came into general discussion, it was entirely logical that the concentrating group should be made up of a fairly large number of ships; in fact, since the pre-dreadnoughts carried relatively few heavy guns, it was not reasonable to expect that the initial advantage could be gained at fairly long ranges, unless a considerable number of ships concentrated their fire. The adoption of this practice was thus a tactical necessity, even though the numerical increase of the concentrating group involved a marked decrease in firing efficiency (*i. e.*, in the percentage of hits made by individual ships).

But with the evolution of battleship design, unit offensive power has increased enormously, though without a corresponding increase in ability to withstand attack. In truth, despite increased

strength of armor, the battleship remains a colossus with feet of clay, particularly in view of the ease with which its offensive power may be compromised. For example, a ship whose fire-control system suffers a casualty is for the time being powerless, and if the enemy succeeds in maintaining a concentrated fire, the advantage so gained may become quickly decisive. Taking into account, therefore, that the latest type of battleship possesses by its very construction a great concentrating power, we may, on the basis of the points already established, set forth the principle that *it is neither necessary nor advisable to increase the numerical size of the concentrating group beyond the point where effectiveness of gun-fire suffers diminution.* In other words, the elemental subdivision may consist of three ships if, in concentrating the fire of such a subdivision, all the ships are able to get the same number of hits as, in a given time, they could secure firing independently; otherwise it is advisable to limit the size of this elemental subdivision to two ships.

Stated in these terms, the issue evidently turns on the fire control. In order that all ships when concentrating may get as many hits as when firing independently, there are two essential conditions:

1. Rapidity of fire should not be reduced; *i. e.,* each ship should fire as rapidly when concentrating as when firing independently.

2. Accuracy of fire should not be reduced; *i. e.,* in order that the spotters may identify their respective salvos, the fire of two or more concentrating ships should not be superimposed.

The first condition is evident; the second may be made clear by the following explanation:

Let us first consider the method by which the ships of the group concentrate while firing simultaneously. In order to apply this method under the most favorable conditions, it is necessary for each ship to spot the ranging shots independently—either by letting the ships fire one after another at the same target, or by firing simultaneously at contiguous targets and getting thereby the necessary data for calculating the sight-bar ranges to the concentration target. For the concentration, when the various ships open fire simultaneously on the same target, then the hits of each ship will be bunched. Now, from the observation of these results, it is necessary for the spotters to control the combined salvos as if they were all fired from one ship. But in doing so, no matter how well

the ranges have been corrected, and no matter how well the initial salvos have been bunched, there will inevitably follow an increasing dispersion in the fall of shells. To verify this, it will be sufficient to consider the following instance. The hits of one ship may be short, while those of another are over. It will be necessary for the spotter of each ship to shift the center of impact of his own salvo; but if the combined salvos appear centered on the target, how is the fire susceptible of improvement? Generally speaking, indeed, this method can give only a small percentage of hits; for example, in recent French target practice, it was shown that when two ships concentrated firing simultaneously (*i. e.*, at the same interval), the number of hits was scarcely greater than when one ship fired alone.

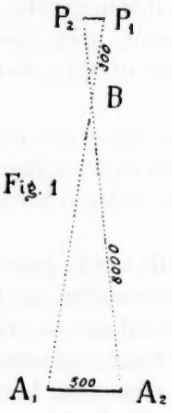

Fig. 1

FIG. 1.

It might be supposed that when two ships fire at the same target, each could distinguish the points of fall of her projectiles by the different locations in the plane of fire. But this is not true; it is impossible to avoid confusion, especially in the case of two adjoining ships. Thus, in Fig. 1, we have two ships A_1 and A_2, which are separated from each other by a distance d and which are concentrating on the target B, range x; let us assume, for a definite case, that P_1 and P_2 are projectiles falling over by a distance $s=BP_1=BP_2$. The distance P_1P_2 between the splashes is determined by the formula

$$P_1P_2=\frac{S}{x}d.$$

Let $d=500$ m.; $x=8000$ m.; $S=300$ m.; the value of P_1P_2 is less than 20 meters. This distance is so small that it would be impossible to tell whether the shell P_1 came from the ship A, or whether it was fired from A_2, somewhat wild laterally.

It is necessary therefore to recognize that, in order to maintain accuracy, the concentration ships should fire not simultaneously but successively; each ship should be autonomous, except that all should observe the prescribed interval between successive salvos to avoid confusion in their identification.

From this it follows that the maximum number of ships that may take part in concentration is given by the formula $\frac{T}{t}$, T being the interval between successive salvos from the same ship, and t the interval between the successive salvos from the concentrating group (fired of course by different ships).

At first glance, it might appear that the value of t could be reduced to a very few seconds; but as a matter of fact, if t is not given a fairly large value, the method will not accomplish its purpose, *i. e.*, the effectiveness of the fire will be diminished. The proof of this may be derived in the following way.

As has been said, it is neither possible nor desirable for each ship to maintain a firing interval with absolute exactness. After a salvo is fired, data are obtained and a sight-bar range is predicted for firing the next salvo. Upon the assumption that the change in range during the prescribed salvo interval remains constant, the necessary range correction is of course combined with the spotter's corrections if the salvo is not apparently centered. Now if the latest range-finder reading indicates that the range predicted for the next salvo will be reached a little before the expiration of the regular interval T, the salvo, if it is ready, will be fired a little ahead of time. Analogously, it will be fired a little after the regular interval, if the range predicted is reached after the interval T.

It will now be conceded that, while the first salvo will be fired at exactly the interval t after the ship preceding, the later salvos will not be fired at precisely this interval, or at least damaging complications are sure to result if the interval is strictly maintained. However, as has been pointed out, the interval is prescribed merely as a guide and not as an ironclad restriction. And aside from all this, the shots of a salvo are not in any case all fired

at the same instant, but within a leeway of a few seconds, so that the interval inevitably suffers some variation.

It is evident from these considerations that if the interval t between the salvos of two ships firing successively, is made too short, then by the little that one lags and the other advances, the shots after a few salvos will be confused, and thus the effectiveness of the fire diminished.

The firing, therefore, should be begun with a sufficient interval between the salvos of successive ships to allow for the above-mentioned variation. If this is done, the fire can be controlled with the greatest freedom; each ship has only itself to think of—that is to say, may conduct its fire as if it were alone; and the shots will never be confused.

We are forced then to conclude that in order to avoid the disadvantage of having the percentage of hits greatly reduced, the interval t must be assigned a value of from 15 to 20 seconds. Now, taking into consideration the value that must be given to T, the number of ships that may properly take part in concentration, that is $\frac{T}{t}$, is equal to *two*. If we wish to concentrate the fire of a larger number of ships, giving the initial interval t the value indicated, each ship cannot develop the maximum rapidity of fire. It may be repeated, then, that the most suitable numerical strength for the elemental subdivision or concentrating group consists of a section of two ships.

It may of course be granted that under favorable conditions the principle of assigning a distinct target to each section may not be applicable. In other words, the number of target ships may be less than half the number of firing ships, either because the enemy is inferior in strength or placed in a very disadvantageous tactical position. The fire of two sections may then be concentrated on the same target, reducing by half the interval t between the salvos of ships firing successively. A certain amount of confusion will be inevitable; but under such circumstances it would not be advisable to do otherwise, since the maximum offensive power of each ship should be utilized.

THE NUMERICAL STRENGTH OF A DIVISION

With the elemental subdivision thus reduced to a section, the extent of the line occupied by it is reduced to 400 or 500 meters;

and consequently the subdivision may be considered well placed for developing the maximum intensity of fire of both ships. This holds even if their column is not quite perpendicular to the line joining their center to that of the enemy. It is true that if the column is not perpendicular to the line joining the two centers (*i. e.*, not in the conventional battle formation), there may be a theoretical disadvantage. In practice, however, this disadvantage is negligible, especially in view of the fact that only a part of the distance between the ships operates to create a difference in the range.

Therefore there is no necessity that the ships of a section should maneuver to maintain the conventional battle formation, that is, to keep in equidistant position.[1] It may be established that in general the ships of a section should maneuver in line ahead. The leader

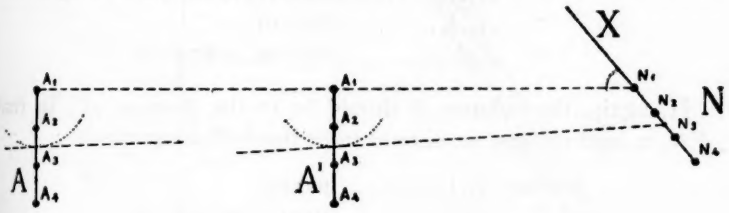

FIG. 2.

should keep the enemy concentration ship on such a bearing as will permit both ships of the section to develop their maximum power of attack. This results in a noteworthy simplification and relief from distractions, and permits the reduction of the distance between the ships of each section to 400 meters.

We are now able to take a step further in this direction, and show that without serious drawbacks the ships of two sections may be kept in column formation.

Fig. 2 reproduces the situation of two divisions of opposing ships, A and N, each composed of four ships. The ships of N are formed line ahead, and the angle XN_1A_1 is approximately 50°. The ships A are steaming on a line of bearing on a course not

[1] Commander Bernotti was a staunch partisan of the formation *posizioni equidistant*, and was the first in the Italian Navy to discuss it (*Rivisti Marittima*, March, 1900; March, 1901). The formation grew out of the idea of concentrating the fire of several ships on one of the enemy.

He shows now that in concentrating by sections, the object for which this formation was intended may better be accomplished by line ahead.

indicated in the figure, but such as to keep the line joining the centers of the opposing forces perpendicular to their line. The distance between ships is 400 meters for N and 500 meters for A.

In this situation, the concentration ship for the section A_1A_2 is N_1, while for the section $A_3\ A_4$ the most convenient target is N_2; in fact for this latter section there is an advantage in firing on N_2 instead of N_3, N_2 being nearer than N_3 (that is, nearer to the middle point of the projection of the line A_3A_4 on N).

For the sections N_1N_2 and N_3N_4, under the conditions of the figure, the target ships are respectively A_1 and A_2.

Now, let us suppose $A_1N_1=8000$ meters; then the ranges will be as follows:

Section A_1A_2.....8000 m.
" N_1N_2.....8000 m. to 8250 m.
" A_3A_4.....8300 m.
" N_3N_4.....8500 m. to 8750 m.

If, again, the column A should be in the position A', so that $A_1N_1=4000$ meters, we should have the following ranges:

Section A_1A_2.....4000 m.
" N_1N_2.....4000 m. to 4250 m.
" A_3A_4.....4300 m.
" N_3N_4.....4500 m. to 4750 m.

This is enough to show that the theoretical disadvantage for N reduces itself in practice to a comparatively insignificant difference in range.

It follows, therefore, that the line ahead may well be prescribed for the tactical handling of four ships, although it is admitted that for a larger number of ships the difficulties which the line ahead formation involves are no longer negligible.

The force constituted by combining two sections is therefore the greatest that in general may maneuver by the simple method of " follow the leader." Hence it is proper to consider the group of four ships as the tactical unit of a fleet.

The conclusion from what has been said is that the group formed of two sections (four ships) constitutes the proper strength for a division.

What influence will the preceding deduction have on the maneuvering tactics of a fleet?

As has been said, the ships of each division should be in line ahead, and the division leaders should maneuver so as to maintain a favorable bearing both for offence and defence.

The guiding principles for the division leaders to follow, in order to secure unity of control and unity of action, may be defined as follows:

1. The interval between division leaders should be the least that will permit forming the fleet in exact column; if 400 meters is the distance between ships, then the division interval should be 1600 meters.

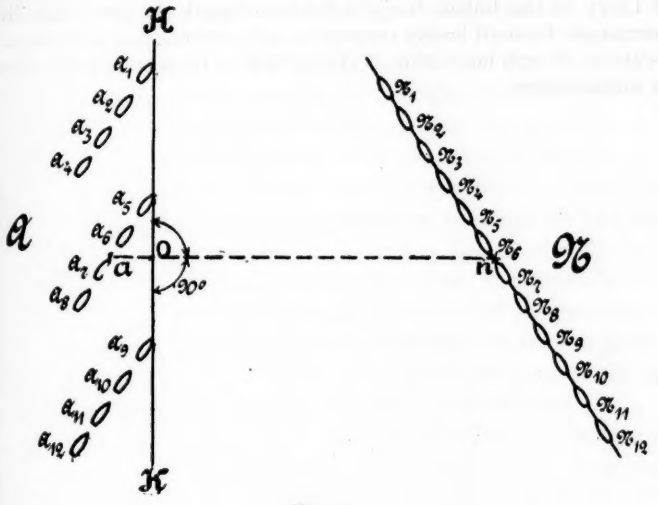

FIG. 3.

2. The leaders of adjoining divisions should maneuver so as to keep the division line of bearing approximately perpendicular to the line joining their center to that of the enemy. (For example, in Fig. 3, the division leaders in squadron *A* will maneuver so as to keep the center-joining line *an* perpendicular to the line *HK*.) This is an application of the general principle of the conventional battle formation. In this way, the squadron will attain an advantageous position or one at least equal to that of the enemy, and the ships will not mask each other's fire.

In respect to the leader of the guide division, the leaders of the other divisions should gradually change course and speed so as to keep the angle *Hon* as nearly 90° as possible.

It would appear easy to do this when there are only two or three divisions. A larger number of divisions might require too great a difference of speed.

A squadron should therefore consist of eight ships or at most of twelve. Beyond that number of ships it would not seem possible to prescribe rules for attaining unity of control and unity of action, at least not without involving the difficulties of a double column. Hence in such cases it would be advisable to form two squadrons which should maneuver separately but coordinately.

TRANSLATORS' NOTE.—In the January *Rivista Marittima* Lieut. Comdr. De Luigi, of the Italian Navy, defends at length the three-ship division. Commander Bernotti briefly summarizes this defence and answers it. This discussion, though interesting, is chiefly local in its bearing and is therefore not included here.

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"WRINKLES" IN PLANE CHART METHODS

By Lieut. Commander Radler de Aquino, B. N.,
Naval Attaché to the Brazilian Embassy

Although Mercator's chart is the navigator's chart *par excellence* the writer proposes in this article to present a few "wrinkles" towards increasing the value and popularity of the Plane Chart, as far as plotting lines of position is concerned.

The "true spirit" of modern navigation requires the plotting of lines of position on a chart and, unless this is done, the best results cannot be obtained, especially when the altitude of the observed body is over 75° or when it is desired to eliminate to a certain extent the systematic and accidental errors. A glance at the lines of position on a chart will immediately show the influence of any one of the component parts of these errors.

Our "protractor diagram" (shown for the first time in the Proceedings No. 147, September 1913, page 1035) represents a plane chart in its most convenient form, because it has a protractor around the border, to facilitate the plotting of lines of position by Sumner's or Marcq St. Hilaire's methods and, if desired, to serve as a substitute for the Plane Traverse Tables.

Plane Chart Difficulty Overcome

In a recent contribution to the pages of the *Nautical Magazine* for October, 1913, page 313, a high authority said:—"The initial difficulty in connection with a chart extemporised by means of squared paper is of course this, that different units have to be employed for measuring latitude and longitude respectively, whereas the side of a square only furnishes a single unit. If for instance we adopt the side of a square as representing so many minutes of latitude, it will be no longer adapted for measuring off

minutes of longitude. We require, in fact, two scales, one for measuring longitude, the other for latitude or distance run."

This difficulty is overcome in a very simple way by means of our "graduated triangle," as will be seen later on.

AQUINO'S GRADUATED TRIANGLE

After a careful study of the advantages and disadvantages of Fontoura's T Square, a description of which appeared in the September 1913, issue of the PROCEEDINGS, page 1042, the writer came to the conclusion that a "graduated triangle" would answer just as well the purpose and be more suitable from a constructional point of view.

He therefore ordered from Messrs. Keuffel and Esser, of New York, one of their well-known 12-inch 30° × 60° xylonite triangles graduated on the edges to be used in connection with his "protractor diagram," as shown on appended engraving.

Its use is easily understood, not only for facilitating the plotting of lines of position by Sumner's or Marcq St. Hilaire's methods, but also for solving a number of problems usually solved by means of the Plane Traverse Tables. The divisions on the edges are the same as those on the diagram. By means of the "diagram" and the "triangle" any plane triangle can be formed and solved.

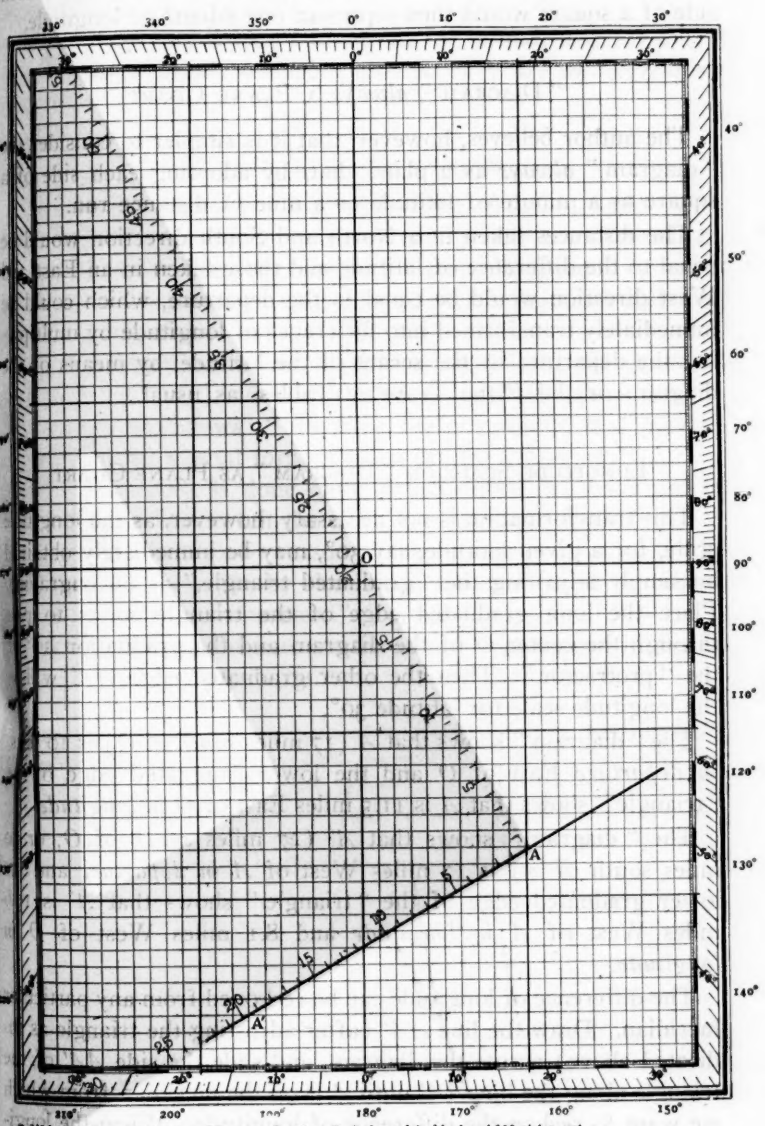
The adjustment of the triangle on the diagram corresponds to a line of position AA' from a body whose azimuth is S 30° E (150°) and an intercept $OA = +20'.0$. The line of position AA' can be immediately drawn once the triangle is properly adjusted. It is not necessary to draw the intercept OA.

With the divisions on the edges it is not necessary that the triangle should be of xylonite or transparent material. It can be of boxwood or rubber and any triangle made from these substances may be graduated and made to answer the purpose.

"DIAGRAM" TRANSFORMED INTO MERCATOR CHART

Our "diagram" can be rapidly transformed into a Mercator chart, if desired, simply by drawing a straight line with an inclination to the line 0°-180° equal to the observer's latitude. If the latitude was 30° the line O-30° (will the reader kindly draw this line?) will show a scale of latitude or of miles for this latitude, each mile being the part of the inclined line comprised between

AQUINO'S "GRADUATED TRIANGLE" AND "PROTRACTOR DIAGRAM"



Published by J. D. Potter, 145, Minories, London, E. C. Issued in blocks of 100 at 4 s. net.
Reduced to ½ of original.

two successive horizontal lines (those parallel to the line 90°-0-270°). This is the method usually followed in France. Each side of a square would then represent one minute of longitude.

"DIAGRAM" *always* A PLANE CHART

The author believes, however, that it is simpler to consider the "diagram" *always* as a plane chart by adopting each side of a square as a minute of latitude or a mile of distance run.

The distances taken in a North and South direction would be equal to the difference of latitude and those taken in an East and West direction would be equal to the departure, which could be immediately transformed into difference of longitude by multiplying the departure by the secant of the latitude, by means of the diagram or the Plane Traverse Tables, as usual.

LONGITUDE SCALE ON "DIAGRAM" AS PLANE CHART

This transformation is not necessary, however, as the longitude scale, for a given latitude, say 30°, may be immediately obtained by simply adjusting the "graduated triangle," as on engraving. Place the long graduated edge of the triangle so as to pass through the center O of the diagram and the graduation 30° of the "protractor." Then the other graduated edge AA' will be the longitude scale for latitude 30°.

The "diagram" shows that A (17 miles *south* of O) is 10 miles *in departure* East of O and the lower graduated edge of the "triangle" shows that A is 11.5 miles East of O *in longitude.*

The "diagram" shows that A' (27 miles *south* of O, or 10 miles south of A) is 17 miles West of A *in departure* and the lower graduated edge of the "triangle" shows that A' is 19.6 miles West of A *in longitude* and 8.1 miles West of O *in longitude.*

The difference of longitude can be reckoned from any particular meridian. Draw the line AA' (after adjusting the triangle as indicated above) across the diagram, and slide the side AA' of the triangle along the line AA' until A is on the meridian from which we want to reckon the difference of longitude. When the longitude is West use the short side of triangle AA'. When it is East use the long side of triangle OA.

Example. If the latitude of A is 30° N and the longitude 20° W of Greenwich, the longitude of O would be 20° 11′.5 W and that of A', 20° 19′.6 W.

In this very simple way both scales for latitude and for longitude are immediately available, just as they are on Mercator's chart.[1]

BLANK MERCATOR'S CHART

The United States Hydrographic Office issues a blank Mercator chart No. 3000 in ten parts extending only from latitude 0° to 53° N or S, but the writer believes the general solution given above to be more convenient from a practical and economical standpoint.

The distinguished writer already quoted from the *Nautical Magazine* (*loc. cit.*) sums up the advantages of the use of our "diagram" as follows: "Amongst the advantages that may be claimed for this special form of chart are the following":

(1) "The work is done more quickly since we have not to hunt for a protractor, but the chart is complete in itself."

(2) "The bearings, by reason of the very clear divisions on the edge, rendered possible by the liberal dimensions of the chart, can be laid off more accurately."

(3) "For the same reasons the work is effected with much less strain upon the eyesight."

[1] In ordinary practice A, the zero of the longitude scale, could be made to coincide with O, the center of the diagram; not only for reckoning the difference of longitude from the center O, but also for facilitating the plotting of lines of position by Sumner's method. The triangle was placed as it is, on the engraving, to enable us to demonstrate also its use in plotting lines of position by Marcq Saint Hilaire's method.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A HALF CENTURY OF NAVAL ADMINISTRATION IN AMERICA, 1861-1911

By CHARLES OSCAR PAULLIN

XI

THE NAVY IN THE SPANISH-AMERICAN WAR, 1898

The larger features and the more important dates of the Spanish-American War will be readily recalled. The first precautionary measures of the department were taken in January, 1898, in view of the critical condition of affairs then existing in Cuba. The blowing up of the *Maine* on February 15 was followed by the appointment of a board of inquiry, of which Rear Admiral Montgomery Sicard was president. On March 9, Congress appropriated $50,000,000 for the national defence. From this time until April 25, when war was declared, the department was incessantly busy preparing for the coming struggle.

The two principal theaters of naval operations were the coast of Cuba and Manila Bay. Since the operations in the Atlantic were chiefly within the West Indies, Key West assumed much importance as a naval base. In Asiatic waters there was a single squadron under Rear Admiral George Dewey. Early in the war the vessels in the Atlantic comprised three fleets: the blockading squadron, commanded by Rear Admiral W. T. Sampson; the flying squadron, commanded by Commodore W. S. Schley; and the northern patrol squadron, commanded by Commodore J. A. Howell. Later, these three squadrons were united under the command of Sampson. The principal events of the war were the destruction of Admiral Montojo's fleet by Commodore Dewey on May 1; the blockade of the Cuban coast throughout the war; the battle of Santiago on July 3, and the operations against Porto Rico in July and August. The ending of hostilities may be dated with the signing of the peace protocol on August 12, 1898.

The work of buying ships was in charge of the Assistant Secretary of the Navy. Between March 16 and August 12 one

hundred and two vessels of all sorts were bought, at a cost of $21,431,000. Before their purchase these vessels were thoroughly inspected by boards of naval officers in order to ascertain whether they were fit for the navy. Many of them were inspected by the New York board, which was appointed on March 12, and of which Captain Frederick Rodgers was president. The most expensive ships and the first to be bought were the *New Orleans* and *Albany,* two protected cruisers, constructed at Elswick, England. The cost of the former was $1,429,000, and of the latter $1,205,000. They were purchased on March 16 from the Brazilian government. The *Albany,* not being completed at the outbreak of hostilities, was in accordance with the laws of neutrality retained in England until after the close of the war. The *New Orleans* rendered valuable service in Cuban waters. The gun-boat *Topeka* was purchased from the Thames Iron Works, in England; the torpedo boat *Somers,* from the Schichau Iron Works, of Elbing, Germany; and the torpedo boat *Manly* from Mr. Charles R. Flint, of New York. The rest of the purchased vessels were merchantmen. Five large ships, the *City of Pekin, St. Paul, St. Louis, New York* and *Paris* were chartered. The government paid for the *St. Paul* a rental of $2500 a day. Two yachts were loaned to the department without charge, and the city of Philadelphia rented her ice-boat for the nominal sum of one dollar. Fifteen revenue cutters, four lighthouses tenders, and two vessels of the Fish Commission were placed temporarily in charge of the department. Altogether 131 ships were added to the navy in one way or another. The maximum fighting force of the regular navy consisted of 73 vessels, and of the auxiliary navy of 123 vessels. Of the 73 ships in the regular navy, 14 had belonged to the old navy, including several old monitors which had not seen service for many years. The strength of the fleet for fighting purposes lay largely in seven ships: the first-class battleships *Indiana, Massachusetts, Oregon* and *Iowa,* the second-class battleship *Texas,* and the two armored cruisers *Brooklyn* and *New York.* These seven vessels, with the possible exception of the coast-defence monitors, comprised at this time our entire sea-going armored fleet.[344]

[344] Ann. Rept. of Sec. of N., 1898, pp. 21-24; Long, New American Navy, I, 150-153.

Nearly five million dollars were expended in preparing the auxiliary vessels for service. The fitting out and repairing of the ships of the regular navy also entailed much work. These tasks fell chiefly to the Bureaus of Construction and Repair and Steam Engineering. Their shops at the five principal navy yards—New York, Norfolk, Mare Island, Boston and League Island—were exceedingly busy throughout the war. The force employed at these yards by the Bureau of Construction and Repair increased from 2200 men in January to more than 6000 men in the summer of 1898. Private shipyards also aided in repairing and converting ships. The purchased merchantmen were strengthened to bear the shock of gun-fire; unnecessary woodwork was taken out, batteries were installed, steam machinery was renewed or repaired, articles of equipment were supplied, and the vessels were freshly docked and painted. Every available ship in ordinary was prepared for service. Some of the old single-turreted monitors of an ancient date were fitted with new boilers by cutting the old ones into pieces and passing them out through the smoke-pipe openings and passing in the sections of the new in the same way. The ship *Vulcan* was made into a floating repair shop, carrying forges, furnaces, machine tools, skilled mechanics and a large outfit of stores, and proved to be exceedingly useful in making repairs on the blockade. For the vessels operating in Cuban waters, Key West was a most important repair station. Many inconveniences, however, were experienced here for want of proper machinery, shops and outfits of tools. The deliveries of needed articles at this point were slow and uncertain.[248]

The Bureau of Equipment furnished the vessels with coal, fresh water, rigging, canvas, galleys, boat supplies, anchors, chains, ground tackle, hawsers, cordage, binnacles, compasses, sextants, chronometers, charts, sails and hammocks. The number of employees of this bureau at the Boston yard, where many articles of equipment were manufactured, was doubled. The number of charts issued by the Hydrographic Office increased six-fold. To meet the demand for new flags and signals, the force in the flag-making department at the New York yard was increased from twelve to eighty persons.

Among the most important tasks of the Bureau of Equipment was the supplying of the fleets with coal and fresh water. Before

[248] Ann. Rept. of Sec. of N., 1898, pp. 34-35, 40, 514-515, 611-614.

the outbreak of hostilities, this bureau endeavored to procure coaling stations in the West Indies, especially in the vicinity of the passages of the Antilles. Such attempts of course could not succeed at so inopportune a time. Recognizing the importance of Key West and the Dry Tortugas as bases of operations, the bureau early contracted for the installation of modern coaling plants at these places, but they were not ready for use when the struggle ended. When the war began there was at Key West but one coal shed, with a capacity of 3000 tons, and before additional provision could be made, the war was well under way. Eventually, all the available space at Key West was covered with coal sheds. Their total capacity, however, was only 9000 tons, not sufficient to fill the bunkers of one of Sampson's largest vessels. Unfortunately, owing to their large drafts, these vessels could not enter Key West harbor or approach within six miles of the coaling wharf, and therefore had to be coaled from lighters or colliers.

Before the war commenced the Bureau of Equipment asked and obtained many offers to supply coal and to transport it to the West Indies. When the crucial moment came, all except one firm refused to adhere to their proposals, owing to the supposed risk of transporting coal to the scene of hostilities. In desperate straits, the bureau was compelled to purchase steamers, convert them into colliers and provide them with crews and officers taken from the navy. The owners of suitable vessels, knowing the necessities of the government, forced it to pay exorbitant prices. Early in April six ships were purchased for $1,247,000, and they were rapidly fitted out and were dispatched to the fleet with cargoes of coal. When the first great emergency was passed additional colliers, mostly foreign vessels, were obtained at fair prices. Recovering from its fright, the private coaling fleet on the Atlantic was employed in carrying coal to the shore stations. At one time 40,000 tons of coal were afloat at Hampton Roads, ready to sail at a moment's notice to any point desired. The fleet of colliers on the Atlantic belonging to the Navy Department in the summer of 1898 consisted of fifteen vessels, with a total capacity of 50,000 tons. Two colliers were purchased on the Pacific coast and sent with coal to Dewey's fleet at Manila. During the entire war no ship suffered the slightest delay from want of coal.[246]

[246] Ann. Rept. of Sec. of N., 1898, pp. 26-27, 270-271.

A much more difficult task of the Bureau of Equipment was the providing of the fleet off the Cuban coast with adequate supplies of fresh water. Some of the boilers of the ships on blockade duty before Santiago were injured for want of this article, and gave Sampson much concern. The distillers on shipboard were generally too small to supply all the needs of the ships. Before the outbreak of the war the Bureau of Equipment contracted for a distiller to be erected at Key West, capable of making 45,000 gallons of fresh water a day, but the contractor failed to complete it until long after the specified time. When finally it was ready for use its capacity was only 25,000 gallons a day, and owing to its imperfect construction frequent repairs were found to be necessary. An evaporating and distilling plant, with a capacity of 50,000 to 60,000 gallons a day, was installed on board the *Iris*, but it was not completed in time to be of service during the war. It was first used in supplying the army at Camp Wikoff on Long Island. The bureau bought considerable water, for some of which it was compelled to pay exorbitant prices.[247]

When it became apparent that a war with Spain was inevitable, the Bureau of Ordnance placed orders with private manufacturers for large quantities of gunpowder, projectiles, fixed ammunition, small arms and guns for secondary batteries. The manufacturers showed every disposition to meet the requirements of the bureau, nor did they in any instance take advantage of its unusual needs. When necessary, they greatly increased the output of their factories and ran them without intermission. During the war one hundred and thirty-five vessels received batteries and complete outfits of ordnance. Five hundred and seventy-six guns were placed on board the vessels of the auxiliary navy. Seventy-five auxiliary torpedo boats were fitted out, and many gun-cotton mines and mining outfits were manufactured. The ordnance shops of the Navy Department worked night and day. The naval gun factory was equal to every demand made upon it. Indeed, the resources of the department and of private manufacturers for ordnance, ammunition and projectiles were but lightly taxed by the brief conflict with Spain.[248]

The plan for purchasing supplies that was inaugurated by Secretary Whitney in 1886 was thoroughly tested by the war, and its

[247] Ann. Rept. of Sec. of N., 1898, pp. 41, 271-272.
[248] Ann. Rept. of Sec. of N., 1898, pp. 31, 463.

efficiency was fully proved. The Bureau of Supplies and Accounts during the period of active operations furnished 193 ships with naval stores. Early in March the bureau established a base of supplies at Key West and commenced making shipments thereto. Here and at several of the navy yards large quantities of provisions, clothing and other articles were collected. The bureau maintained at Key West a three months' supply of stores for 8000 men; at New York a three months' supply for 9000 men; and at Norfolk and Mare Island, each, a three months' supply for 4000 men. New York was the chief market for naval stores, and the New York navy yard was the chief receiving and distributing depot of the navy. To meet the needs of the greatly enlarged personnel of the navy, the bureau manufactured more than a million garments. The prices paid during the war were on the average no higher than those paid during peace.

Early in April the commander-in-chief of the Asiatic station was directed to fill his ships with stores and to buy a collier and supply ship, and within forty-eight hours after receiving his orders, he had purchased the *Nashan* and *Zafiro*. The former he loaded with coal and the latter with provisions. When war was declared, he was in possession of supplies sufficient to last for five months. Early in May the *City of Pekin* was dispatched from San Francisco with three months' provisions for the Asiatic fleet and a large consignment of miscellaneous stores. In June a refrigerating ship, laden with 600,000 pounds of fresh meats and a like quantity of fresh vegetables, was sent from San Francisco to Manila. Sampson's first refrigerating ship was the *Supply*, which on May 7 sailed for the fleet off Cuba loaded with fresh meats, vegetables, fruits, ice and other supplies. Subsequently, two other ships, the *Celtic* and *Glacier*, were fitted out with refrigerators, and were used to carry supplies to the naval vessels in the West Indies.

Another task that fell to the Bureau of Provisions and Clothing was the caring for prisoners. On receiving information that 1720 Spanish prisoners from Admiral Cervera's fleet were to be quartered on Seavey's Island in Portsmouth harbor, New Hampshire, and were expected to arrive there within two or three days, the bureau at once assembled all necessary provisions at the island, and when the Spaniards arrived, all was in readiness. A wholesome dinner was served to the prisoners, and each man was

furnished with a mattress, hammock, two blankets and such clothing as he needed.[249]

Immediately after the destruction of the *Maine*, the Bureau of Medicine and Surgery made preparations to meet every contingency. The naval hospitals were equipped to their full capacity for the accommodation of patients, and the naval laboratory at New York made preparations to issue supplies on short notice. Medical and surgical outfits suitable for the auxiliary vessels were purchased, assembled and boxed, ready for shipment whenever and wherever needed. In no instance did any vessel have to wait for its medical stores. Forty-two assistant surgeons were appointed, and nineteen assistant and passed assistant surgeons were mustered into service with the state militia. In sixteen days the merchantman *Creole* was converted into the hospital ship *Solace*, and fitted out with modern medical appliances, a well-lighted operating room, a steam disinfecting plant, an ice machine, a steam laundry plant, cold storage rooms and an elevator for taking patients from the operating room and upper deck to the wards below. The *Solace* accommodated 200 patients, either in berths, swinging cots or staterooms. She was supplied with fresh water by means of distillers and evaporators. Her medical officers inaugurated a complete system of antiseptic surgery at sea—the first ever established. The wounded at the battle of Santiago, both American and Spanish, were taken on board the *Solace*, and transported to the naval hospital at Norfolk. Temporary hospitals were erected at Seavey's Island to accommodate the sick Spanish prisoners. Several young women volunteered their services as nurses, and were assigned to duty at the naval hospitals at New York and Norfolk. A permanent naval hospital corps was organized in accordance with an act of Congress approved on June 17, 1898.[250]

The supplying of the new ships with officers and seamen fell to the Bureau of Navigation. In all 813 officers received temporary appointments. Of these, 456 were line officers, varying in rank from commander to naval cadet. Two hundred and sixty-three officers entered the service from the naval militia. Two hundred and twenty-five officers on the retired list of the navy were assigned such duties as their age or physical condition permitted. Many more men applied for service than were needed. Examin-

[249] Ann. Rept. of Sec. of N., 1898, pp. 665-666.
[250] Ann. Rept. of Sec. of N., 1898, pp. 769-773.

ing boards were appointed to ascertain the professional knowledge of the applicants. The volunteer officers were assigned to duty in the Auxiliary Naval Force and the Coast Signal Service, and on board the small cruising ships, such as the *Yankee, Dixie* and *Prairie*. A few of them saw duty in West Indian waters, but many of them did not leave the coast of the United States. Naturally they were deficient in professional experience and training, but they were zealous and attentive to duty. Immediately after the signing of the peace protocol most of the volunteer officers were discharged; a few, however, still remained in service in 1899. During the war forty-three second lieutenants received commissions in the marine corps.[261]

Prior to the outbreak of hostilities the number of enlisted men allowed by law was 12,500. On August 15, when the enlisted force reached its maximum, it numbered 24,123 men. On March 28 a circular letter was issued by the Navy Department calling for enlistments for one year, and on this basis 9767 men entered the service. Three thousand eight hundred and thirty-two men were obtained from the naval militia. Thousands of men applied for enlistment, whose services were not needed. For the fiscal year ending June 30, 1898, 63,135 applicants were rejected. Many of the recruits were landsmen, perchance clerks, lawyers, or professional men, and not seamen in any sense, and totally unfit for their new calling. By June 30, 1899, the enlisted force had been reduced to 14,501 men. During the war the marines were increased by some 2100 men.[262]

Two large and important organizations, the Auxiliary Naval Force and the Coast Signal Service, were established early in the war, and were discontinued at its close. The Auxiliary Naval Force, organized for the purpose of defending the coast of the United States, constituted the "second line of defence." It guarded and patrolled the coast and protected the submarine mines, and served to give the people of the Atlantic Gulf and Pacific states a feeling of safety. The commencement of this organization may be dated with the order of the Navy Department to Commander Horace Elmer to prepare with all possible dispatch a plan for a "mosquito fleet," in "general accordance with the methods prepared by the Naval War College." Elmer,

[261] Ann. Rept. of Sec. of N., 1898, pp. 29-30, 132.
[262] Ann. Rept. of Sec. of N., 1898, pp. 23, 320, 827; 1899, pp. 19, 404.

who established his headquarters at New York, was assisted in his work, which was most complicated and arduous, by the officers and clerical force of the New York navy yard, by the New York naval militia and by the New York board on auxiliary vessels. When war was declared on April 25 many details of a plan of organization had been worked out. At this critical moment Commander Elmer died, and was succeeded by Rear Admiral Henry Erben (retired), who proceeded to put into operation the plan of his predecessor. During the first month of his work he was considerably hampered by the delay of Congress in passing legislation providing for an auxiliary force. A measure which met the views of the department had been drafted in the first week of April. Finally, on May 26 a joint resolution of Congress was passed authorizing the organization of the United States Auxiliary Naval Force, and appropriating $3,000,000 for the purchase or hire of vessels.[253] Erben was at once made chief of the new organization. The officers and enlisted men of the force were paid from the regular appropriation for the "pay of the navy."

On July 9 Erben was succeeded by Captain John R. Bartlett (retired), the chief intelligence officer, who had charge of the force until it was discontinued, and on the same day the headquarters were removed from New York to the Office of Naval Intelligence in the Navy Department at Washington. The Auxiliary Naval Force was under the general supervision of the Assistant Secretary of the Navy. Early in July its staff consisted of two lieutenants, two naval constructors, six chief engineers, two pay officers and three surgeons. It was recruited almost entirely from the state naval militia, from which source about 1400 men, exclusive of officers, were derived. A few men came from the merchant service. To facilitate the work of the force, the coast of the United States was divided into nine districts (six on the Atlantic, two on the Gulf and one on the Pacific coast), and a naval officer was placed in charge of them. The vessels of the force, forty-one in number, were distributed among the districts, and were stationed at the important ports and strategic points. Twenty-three vessels were employed in patrolling mine-fields and in maintaining the quarantine regulations. Some of them cruised from port to port, or went to sea for target practice. Ten of the vessels were old monitors, which had been in ordinary for many

[253] U. S. Statutes at Large, XXX, 744-745.

years. The officers of the force furnished their own uniforms and side arms, and the enlisted men came into the service uniformed, armed and equipped. The officers and men of a given district were generally selected from the naval militia of the adjoining states, since their knowledge of local waters and of local conditions gave them a special aptitude for patrol duty near home.[254]

The Coast Signal Service, like the Naval Auxiliary Force, was organized to assist in the defence of the coast. Before a war with Spain was anticipated, Secretary Long on October 18, 1897, appointed a board, of which Commander John Schouler was president, to consider the establishment of "coast signal stations for naval defence." On October 27 this board reported a plan for a coast signal service, but no further action was taken on the subject by the department at that time. On March 15, 1898, Secretary Long, moved by the prospects of a war, ordered Captain C. F. Goodrich, president of the Naval War College, to make and report with dispatch a preliminary plan for the establishment of a coast signal service on the Atlantic and Gulf coasts. Goodrich made a report which closely followed the recommendations of the Schouler board, and on April 9 the department ordered him to establish a coast-line system of signal stations in accordance with the plan contained in his report and in consultation with the Naval War Board. Goodrich fixed his headquarters at New York on board the U. S. S. *New Hampshire,* the armory of the First Naval Battalion of New York. On April 23 he was relieved by Captain Theodore F. Kane (retired), and on May 9 Kane was succeeded by Captain John R. Bartlett, who served until the service was discontinued. Bartlett transferred the headquarters to the Naval Intelligence Office in Washington, and conducted his work under the general supervision of the Bureau of Navigation.

For the purposes of this service, the coast from Maine to Texas was divided into eight districts, and thirty-six signal stations, officered and manned entirely by men drawn from the naval militia, were established. The stations were in telegraphic or telephonic communication with the central office in Washington, and were connected with the lines of the Life Saving Service on the beach. The light-house keepers and the observers of the U. S. Weather Bureau along the coast were also brought into the

[254] Ann. Rept. of Sec. of N., 1898, pp. 19-20, 105-137, 143.

system. Altogether there were in the service 210 naval militiamen, 1443 men of the Life Saving Service, 850 light-house keepers and 33 observers of the Weather Bureau; a total of 2526 men. These observers were stationed on the Atlantic and Gulf coasts, and were continually on the lookout for the vessels of the enemy and suspicious craft of all sorts, as well as for American vessels, the movements of which they watched. While no Spanish ships came within the range of their observations, they several times made important reports of the vessels of our own fleet, and announced the arrival of the *Oregon* from her famous cruise around Cape Horn. The knowledge that was gained in establishing the system will be of much value in case of another war.[255]

In its efforts to mobilize rapidly a naval force the department was much hampered by its want of jurisdiction over the naval militia of the states, which were of course organized under state laws. Officers and enlisted men were mustered into the several divisions of the federal service from the militia as they were needed. On the outbreak of the war, the number of men in these state organizations was rapidly increased, and many militiamen were disappointed in not being called into the federal service. All told, the naval militia furnished the navy 4316 men. Of these, 2600 men served in the regular navy, and the rest in the Auxiliary Naval Force or the Coast Signal Service. The militiamen of a state were often assigned to widely different duties. Those of only one state, Michigan, were kept together, being assigned to duty on board the U. S. S. *Yosemite*. While the officers and seamen from the state organizations were zealous and patriotic and rapidly acquired experience and efficiency they naturally were less competent than the regularly-trained officers and seasoned man-of-wars' men.[256] After the war many attempts were made to obtain the establishment of a permanent national naval reserve, but they all failed.

[255] Ann. Rept. of Sec. of N., 1898, pp. 20, 386.
[256] Ann. Rept. of Sec. of N., 1898, pp. 137-149.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

UNITED STATES NAVAL RADIO SERVICE

By CAPTAIN W. H. G. BULLARD, U. S. Navy
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HISTORICAL

In the year 1899 the Navy Department (Bureau of Equipment) first began seriously to investigate the general subject of the transmission of signals by electric waves, made possible by a system developed by Mr. Marconi and generally known at that time as Marconi wireless telegraphy.

Previous to this time many experiments had been carried on in parts of Europe to develop this means of transmission of signals, following the experiments of Professor Hertz on electric wave phenomena. In June, 1896, Mr. Marconi lodged his application for the first British patent for wireless telegraphy, and immediately experiments were taken up by the British Post Office authorities. At the beginning of 1897 communication was established over a distance of four miles, and by the latter part of the year, a distance of 14½ miles was reached between the first Marconi station erected on the Isle of Wight and South Cliff, Bournemouth, England. In 1899, three British warships, the flagship *Alexandria* and the cruisers *Europa* and *Juno* were equipped with Marconi apparatus, and messages were correctly exchanged between these vessels up to 74 nautical miles. Many other experimenters in different parts of Europe and some in the United States were carrying on trials and tests in this mode of communication, and at this time, the liveliest interest was evinced in this rapidly expanding science. The results attained on the English warships were so successful, that in the same year, 1899, Mr. Marconi brought three sets of his apparatus to this country for the use of the *New York Herald* in reporting the international yacht races for that year between the *Shamrock* and the *Columbia*. During these trials, the Navy Department directed a board of four officers to observe and report upon the working of the sys-

tem. This may be said to have been the beginning of the use of wireless apparatus for the Navy Department, and was, in fact, the first government recognition of the possibilities involved, and as such this department of the government has always received proper credit for its forethought.

Following the report of the board referred to, the department placed two ships and a torpedo boat at the disposal of Mr. Marconi for further experiments with a shore station, established by permission of the Treasury Department on the grounds of the Highland Lights, near the entrance to the port of New York. This station has the distinction of being the first shore station erected in the United States, and the three vessels, the armored cruiser *New York,* battleship *Massachusetts* and the torpedo boat *Porter,* the first vessels of the U. S. Navy to be equipped with radio apparatus.

Another board was ordered to report on a series of trials lasting over a week, in the port of New York and at sea off the Highland Lights. This board made a favorable report on the usefulness of the Marconi system, but discovered the very serious defect that exists to some extent at this day, that of interference. At this time the department did not find it advisable to conduct any further experiments with the Marconi apparatus, but later recommended the installation of the Marconi devices on board several ships of the navy.

1900-1901

In the summer of 1900 apparatus similar to that of the Marconi system was installed at the Naval Torpedo Station, Newport, R. I., and instructions were given to a class of officers and men.

In 1900 and 1901 the Bureau of Equipment paid particular attention to the practical development of radiotelegraphy. The year's yacht races were again reported by means of radio apparatus and the efforts of press companies to report results were witnessed by an officer of the bureau. The systems in use at that time were those of the Marconi Company, the American Wireless Telegraph Company (De Forest system) and the American Wireless Telegraph and Telephone Company. Although the difficulties of interference could not be overcome, in its absence the apparatus of all companies worked successfully.

Other systems were being developed abroad, notably the Slaby-Arco system in Germany and the Ducretet system in France and

Russia. The only new installations in the United States during this period, up to June, 1901, were those made by the *New York Herald* on board the government light-ship anchored off New South Shoals, and a similar station on Nantucket Island near the village of Siasconet, established for the purpose of reporting the arrival of transatlantic steamers.

This was a period of extravagant claims of all kinds by the various companies entering the commercial field, and it did not appear advisable to the Bureau of Equipment to adopt any particular system, as it was believed that none of them had yet passed beyond the experimental stage.

1901-1902

In October, 1901, Commander F. M. Barber, U. S. Navy, at that time retired and living in Paris, was, at the request of the Bureau of Equipment, especially detailed for duty in connection with the investigation of the subject of radiotelegraphy as being developed on the continent of Europe, and this officer made numerous valuable reports containing a great amount of information and constantly advised the bureau of the latest developments and inventions. There were four recognized systems developed in Europe at this time; viz., the Slaby-Arco and Braun-Siemens-Halske, manufactured in Berlin, and the Rochefort and Ducretet, manufactured in Paris. The Bureau of Equipment purchased two sets of each of these systems, with the intention of testing the different kinds of apparatus in competition. Later, duplicate sets were purchased of the Lodge-Muirhead system of London, and the De Forest system of the United States. The Bureau of Equipment was not able to reach any satisfactory arrangement with the Marconi Wireless Telegraph Company for the purchase of its appliances, if after test it was desired. The company offered a duplicate set for test, but required it to be returned after the trials were finished, and further required the payment of a given sum for each set upon delivery and a royalty each year during the life of its patents. This was prohibitive on account of the cost involved and to the fact that it was illegal to obligate the payment of money beyond a single year.

During this period, 1901-1902, the Bureau of Equipment, to which was assigned the general subject of radiotelegraphy, was handicapped by a lack of officers to carry on this most important branch of its duties. Investigation showed that all countries were

alive to the importance of the fast developing science, and that many countries had special commissions composed of army and navy officers and civilian experts to study the needs from a government point of view, and there was no navy administration that was not giving special attention to this subject. In the United States, those engaged in radiotelegraphy were assigned these duties in addition to their ordinary duties, and great credit should be given to these pioneers who assiduously worked in and out of hours that the Navy Department might be possessed of the best apparatus to be had at that time. Those especially engaged in this work were Commander Barber, then retired, the late Lieutenant Commander Beecher and the late Lieutenant J. M. Hudgins.

The great importance of radiotelegraphy as a means of communication between ships at sea and between ships and shore stations was well recognized and in consideration of the greatly increased value of such communication in time of war, the Bureau of Equipment invited the attention of the department to this special use, and recommended appropriate action on the part of the government to secure control over *all* radiotelegraphic stations along the coast. As early as this time, 1902, there were evidences that foreign governments were exercising careful supervision over the location of radio stations within their respective territorial limits with a view of having at all times absolute control thereof. If the recommendations of the bureau had been heeded, much of the interference complained of at this day might have been eliminated, and we might not now see our coasts dotted with radio stations built by foreign capital and equipped with foreign apparatus.

1902-1903

In August, 1902, a board of five naval officers was appointed by the Navy Department for the purpose of conducting tests of the various types of radio apparatus that had been previously obtained for this purpose. In general, the instructions to the board required a test of duplicate sets of the same make under the following conditions:

(1) Between two shore stations. Washington and Annapolis, 30 miles apart, were selected for these tests.

(2) Between Annapolis and a moving ship in Chesapeake Bay.

(3) Between two ships at sea, and at a considerable distance from the land.

The report of the board was made one year later, in September, 1903, and stated that the Slaby-Arco apparatus was superior to the other systems. Accordingly, 20 sets of this system were ordered for installation on ships and stations, and the following ships were equipped:

Baltimore,	*Illinois,*	*Prairie,*	*Topeka.*
Kearsarge,	*Olympia,*	*Texas,*	

and the following shore stations were equipped in the same manner:

Cape Elizabeth, Me.,	Navy Yard, N. Y.,
Newport, R. I.,	Highlands of Navesink, N. J.
Montauk Point, N. Y.,	

The first ships to be fitted were the *Prairie* and *Topeka* which were used in the tests previously held.

In addition to the stations above mentioned, it was proposed to install apparatus in the following shore stations:

Navy Yard, Portsmouth, N. H.,	Cape Henry, Va.,
Navy Yard, Boston, Mass.,	Key West, Fla.,
Thatcher's Island, Cape Ann, Mass.,	Dry Tortugas, Fla.,
Highland Light, Cape Cod, Mass.,	Pensacola, Fla.

1903-1904

In August, 1903, a preliminary international wireless telegraph conference met at Berlin at which the United States was represented by Brig. Gen. A. W. Greely, U. S. A., Commander F. M. Barber, U. S. Navy (Retired), and Mr. John J. Watterbury of the Department of Commerce and Labor. A protocol was prepared by the conference which the delegates from several countries, including those from the United States, agreed to submit to their respective governments with recommendations that it be made the basis of an international convention. A summary of the protocol adopted by the convention is as follows:

Article I.—Concerns exchange of messages between vessels at sea and commercial coast stations under the following headings:

First. Defines coast station.

Second. Coast stations must receive from or forward to vessels at sea all wireless telegrams, irrespective of the system of wireless telegraph employed.

Third. Technical information likely to facilitate communication between vessels and coast stations must be made public.

Fourth. Fixes tariff rates for messages.

Article II.—Provides that an international convention shall establish rules regulating exchange of communications between ships and shore stations.

Article III.—Extends provisions of the St. Petersburg Telegraph Convention to wireless telegraphy.

Article IV.—Gives preference to signals of distress.

Article V.—Provides that all wireless telegraph stations shall be used in such a manner as to interfere as little as possible with other stations.

Article VI.—Reserves to any contracting government the right to enforce obedience by commercial stations in the respective countries to any regulations laid down by international convention.

Article VII.—Relieves government stations from all regulations except Articles IV and V.

Article VIII.—Provides for admission, on request, of other countries.

As a result of this preliminary conference, the International Radiotelegraphic Convention of Berlin was signed on November 3, 1906, and although the United States was represented at the preliminary convention, the result of which was the Berlin Convention, for reasons that cannot here be stated, the government did not become a signatory party to the convention until the spring of 1912, and was not bound by its provisions until May 25, 1912.

1903-1904

The years of 1903 and 1904 brought continued activity in the installation of radio apparatus both on ship and shore stations. Up to June 30, 1904, the following shore stations were equipped and put in operation:

Cape Elizabeth, Me.,
Portsmouth, N. H.,
Key West, Fla.,
Cape Ann, Mass.,
Montauk, L. I.,
Washington, D. C.,
Cape Henry, Va.,
Culebra, W. I.,
Cape Cod, Mass.,
Navy Yard, New York, N. Y.,
Highlands, N. Y.,
Dry Tortugas, Fla.,
Boston, Mass.,
Annapolis, Md.,
Norfolk, Va.,
San Juan, P. R.,
Mare Island, Cal.,
Yerba Buena, Cal.

Apparatus was installed on the following ships:

Alabama,	*Detroit,*	*Massachusetts,*	*Olympia,*
Atlanta,	*Dixie,*	*Mayflower,*	*Prairie,*
Baltimore	*Iowa,*	*Minneapolis,*	*Solace,*
Boston,	*Illinois,*	*Missouri,*	*Texas,*
Brooklyn,	*Kearsarge,*	*Newark,*	*Topeka,*
Columbia,	*Maine,*	*New York,*	*Yankee.*

And it was proposed to install apparatus on 69 other ships, practically all ships in commission or to be commissioned. Contract was also entered into for the installation on two light-ships, which relieve each other on Nantucket Shoals, and preparations were made for the installation of a set on the Farallon Islands off the Golden Gate, California, and at Cavite, P. I., and Colon, R. P. Preparations were also made for establishing stations at Honolulu and Guam.

As an illustration of the activity at this period, and of the number of stations it was thought necessary to equip to meet the requirements of the navy and the merchant service, the following list shows the proposed additional sites to be equipped with radio apparatus:

Frenchman Bay, Me., or vicinity,
Absecon Inlet, N. J.,
Cape Henlopen,
Assateague Inlet, between Currituck Beach light and Bodie Island light,
Cape Hatteras,
Cape Lookout,
Cape Fear,
Cape Romaine,
Charleston, S. C.,
Savannah River,
Cape Canaveral,
Cape Florida,
Alligator Reef,
Boca Grande,
Point Cebu,
Surigao Straits,
Tampa,
Cedar Keys,
Cape San Blas,
Mobile Bay,
Mouth of the Mississippi River,
New Orleans,
Raccoon Pt., La.,
Sabine Pass,
Galveston. Texas,
Mouth Rio Grande River,
Bahia Honda,
San Diego,
San Pedro,
Point Conception,
Point Sur,
Point Arena,
Point Tabunan,
Cape Mendocino,
Cape Blanco,
Columbia River,
Cape Flattery,
Point Townsend,
Bremerton,
Sitka,
Dutch Harbor,
Kisha Island,
Midway Islands,
Tutuila,
Cape Bojeador,
Point Predias,
Capones,
Olongapo,
San Bernardino Straits,
Point Suban,
Iloilo,
Busilan Straits.

It is needless to say that most of these stations were never built as the rapid development of the art rendered longer distance communication possible and the need of such a large number of stations no longer existed.

During the year 1904 it was first proposed to establish a time signal system by wireless telegraphy in connection with the Naval Observatory, and a wireless telegraph storm-warning signal service in connection with the Weather Bureau of the Department of Agriculture.

1904-1905

On June 24, 1904, the President appointed a board, since designated as the Inter-Departmental Board, to consider the entire question of wireless (radio) telegraphy in the service of the National Government. This board had as its members Rear Admiral Robley D. Evans, Rear Admiral Henry N. Manney, Brig. Gen. A. W. Greely, Lt. Comdr. Joseph L. Jayne and Prof. Willis L. Moore. At that time the following was found to be the status regarding government radiotelegraphic stations:

(a) The Department of Commerce and Labor had established no stations, but permission had been granted to other departments to erect 10 on lighthouse reservations and on the Nantucket Shoals light-ship and its relief.

(b) The army had operated six stations and was preparing to install two others in Alaska. Four other army stations were proposed.

(c) The Department of Agriculture had established 21 shore stations and contemplated others at prominent points along the coast.

(d) The Navy Department had established 20 shore stations. Arrangements were being made for the establishment of 10 more in the near future, for which the complete equipment, or some portion of it, had been ordered for each one. This included two light-ships that took turns on Nantucket Shoals. In addition to these 30 stations, it was proposed to establish about 50 more on shore. Twenty-four naval ships had already been equipped and 10 others were to be equipped immediately. It was proposed to equip 68 others in the very near future. In all there were installed or provided for about 200 radio sets on shore and afloat.

(e) The Treasury Department, while having under consideration radio installations for the Life Saving Service and the Revenue Marine Service, had established no stations, but had relied on a leased commercial radio system.

The following was found to be the status of private stations:

The Marconi Company had a long-distance station on Cape Cod for communicating across the Atlantic, and two others of comparatively short range on Long Island. The board understood that that company proposed to establish numerous stations along the Atlantic and Pacific coasts.

The New York Herald Company had a station on the lighthouse reservation on Sankaty Head, Nantucket Island, and had been permitted to maintain stations on the two light-ships which relieved each other on Nantucket Shoals. These privileges had been withdrawn, however, owing to the refusal of the Marconi Company, which operated them for the *Herald,* to receive wireless messages from vessels using other systems.

The American De Forest Wireless Telegraph Company and the National Electric Signal Company (Fessenden system), had stations in the vicinity of New York, and both proposed to establish a chain of them along the coast. The former company had already begun operations at Cape Hatteras and at Key West, and had announced that they proposed to establish several stations to bridge the Pacific and make foreign connections. It had also established several stations away from the sea coast, especially on the Great Lakes, and was planning to have a regular interior system, according to one of its officers.

The Fessenden system had stations in Philadelphia and Washington. Fessenden stated that his company was negotiating for permission to establish communication with Bermuda.

The *Providence Journal* maintained several stations in the vicinity of Narragansett Bay, and there were several other systems which were at that time not very active.

On the Pacific coast the Pacific Wireless Telegraph Company had several stations, and had been making persistent efforts to obtain authority to establish stations on the lighthouse reservation, Farallon Islands, and at other prominent government reservations along the Pacific coast.

There was an inter-island system operated in Hawaii.

Among the conclusions of the board were:

That wireless telegraphy is of paramount interest to the government through the Navy Department, and that its use by the signal corps of the army for communication between military posts of the army and other necessary links will be necessary both in peace and war, and such use shall

be unrestricted. When interference seems probable between stations of the Navy and War Departments the question involved shall be mutually settled by representatives of the two departments.

That the maintenance of a complete coastwise system of wireless telegraphy by the Navy Department is necessary for the efficient and economical management of the fleets of the United States in time of peace and their efficient maneuvering in time of war.

Among the recommendations of the Inter-Departmental Board were:

That the necessary steps be taken that the Navy Department may equip and install a complete coastwise wireless telegraph system covering the entire coasts of the United States, its insular possessions and the Canal Zone in Panama.

We recommend that as fast as the naval wireless telegraph stations are put in operation the Navy Department be directed to receive and transmit through these stations, free of charge, all wireless messages to or from ships at sea, provided such stations do not come in competition with commercial stations, until such time as Congress may enact the necessary legislation governing this subject.

In conclusion, the board deems it essential that the Executive take such action as in his judgment seems wise to prevent the erection of private wireless telegraph stations where they may interfere with naval or military operations of the government until legislation may be had by Congress on this subject.

On July 29, 1904, the President approved the report of the Inter-Departmental Board and directed the several departments concerned to put its recommenations into effect.

The approval of this report virtually put the control of all coast radio stations under the jurisdiction of the Navy Department, and from that time until the present no other department of the government has operated coast stations with the exception of a few signal corps stations in Alaska, which are a necessary part of the Washington-Alaska-Military-Cable and Telegraph System.

In the spring and summer of 1905 large stations were built at Pensacola, Key West and San Juan, and new stations were built at Guantanamo and Colon. The stations at Cape Henlopen; Beaufort, N. C.; Charleston, S. C.; St. Augustine, Fla.; Jupiter Inlet, Fla., and New Orleans, La., were completed.

This period was also one of development and no standard set of apparatus had been decided upon. Comparative tests of apparatus furnished by a number of wireless telegraph companies were made, particular attention being given to methods of secrecy in

sending and prevention of interference with messages being sent; also to ascertaining the relation of the various systems. In these tests the instruments were installed and operated by the representatives of the respective companies. All the principal companies at home and abroad, except the Marconi Company, entered the competition. This company offered to compete but for some unknown reason afterwards withdrew.

In the spring of 1905 the sending out of the noontime signal was first attempted and was made possible by co-operation of the Western Union Telegraph Company with the Naval Observatory, by means of which the time signals were received at the shore radio stations over the land lines, and by means of proper relays, the closing of the circuit in the Observatory, energized the transmitting apparatus during the interval the circuit was closed, and a series of dots were thus sent broadcast. The shore stations at Portsmouth, N. H.; Boston, Mass.; Navy Yard, New York; Washington, D. C.; Norfolk, Va.; Key West, Fla., and Mare Island, Cal., were the first equipped to send out the noontime signals.

Messages relating to storm warnings and other meteorological observations furnished by the Weather Bureau were sent broadcast to sea by the coast stations.

1905-1906

Progress made in radiotelegraphy for the above period was very great and the results achieved highly satisfactory. It remained the policy of the bureau to purchase different types of wireless apparatus from the various manufacturers in this country for installation in ship and shore stations, in order to encourage competition.

A complete chain of stations was established along the Atlantic and Gulf coasts, in the West Indies and on the Isthmus of Panama, and a chain was being completed on the Pacific coast from Tatoosh Island to Cape Flattery. The following additional stations were erected: Point Arguello, Cal.; Point Loma, Cal.; Navy Yard, Puget Sound; Honolulu, Hawaii, and Island of Guam.

Extensive changes were made in the stations at Cape Elizabeth, Cape Cod, Montauk Point and the Highlands of Navesink, and new apparatus was installed at the Portsmouth and Boston sta-

tions. Owing to the increased range of other stations in that vicinity the station at Cape Ann was abandoned.

The following table shows a comparative statement of the vessels and shore stations in the country and abroad equipped or about to be equipped with radiotelegraphic apparatus. From this it will be seen that, excluding the installations on foreign vessels, the United States had in operation more than half of all wireless installations in the world.

	U. S.	Foreign
Shore Stations (Naval)	39	157
Shore Stations (Commercial and Army)	57	
Vessels (Naval)	57	
Vessels (Merchant)	56	81

The noontime signal was extended to all Atlantic and Pacific coast stations, and connections were made with local telegraph and telephone lines, especially those of the Life Saving Service and Weather Bureau.

Following the recommendations of the Inter-Department Board the coast stations were put in condition to receive and transmit to their destination messages from ships at sea. This was done free of charge and arrangements were made with the telegraph and telephone lines to forward such messages without prepayment. When a message was not prepaid, the company delivering it collected all charges, all arrangements as to tariffs, payment of messages, etc., were made between shipowners or agents and the companies operating the land lines, and the government played no part other than the receiving and transmission of messages to their destination.

1906-1907

Progress continued to be marked and the reliable radius of action both of shore and ship stations was considerably increased, effected not only by improvement in apparatus, but by a better practical working knowledge of the art, as each year found many more persons engaged in studying the theory with a consequent result of much improved material.

Installation of apparatus was continued on ships not already provided, and in some ships apparatus that was already out of date was replaced. Twenty ships were so equipped. The state of the art was such that constant attention was paid to material in order to keep pace with current development and to maintain the stations in the highest state of efficiency.

The stations at the Highlands and Montauk Point were abandoned as being not necessary for the maintenance of the coastwise chain and in place thereof a new station at Fire Island was put in satisfactory operation.

The chain on the Pacific coast was completed by the erection of stations at Tatoosh Island, North Head, Cape Blanco and Table Bluff (Eureka) and a station was in process of erection at Sitka by which it was hoped to maintain communication between Alaska and the Pacific coast of the United States. New apparatus was installed at the navy yards at Washington and New York.

As an indication of the distance of reliable communication at this period, the station at Point Loma (San Diego) reported hearing communication between the U. S. S. *Connecticut,* off the eastern coast of Cuba, and the Pensacola Station, and copied some of the messages. This was probably the longest reliable distance ever made up to that time.

1907-1908

Marked progress continued in radiotelegraphy, and there were many developments in apparatus whereby many of the early difficulties and imperfections were eliminated, resulting in great improvement both in range and accuracy of transmission of messages. Endeavors were concentrated on improving the apparatus already installed in the different stations to keep all in a high state of efficiency.

Recent developments in the art seemed to warrant the establishment of high-powered, long distance stations, and it was contemplated to erect in the near future such stations at Washington, on the Pacific coast, at Hawaii, Guam, Samoa and the Philippines, so that, wherever it might be, the fleet would at all times be in direct communication with Washington. Such stations would be important, not only as an adjunct to the navy both in time of peace and in time of war, but they would be of the greatest value to the merchant marine. All the coast stations were utilized by the Hydrographic Office in collecting and disseminating information with regard to storms, derelicts, icebergs and general meteorological information. Noontime signals were also sent out broadcast by the Naval Observatory through the coast stations.

The utility of wireless apparatus on merchant vessels was fast being recognized, and at this period every thing pointed to the

fact that all vessels that go to sea must eventually be so fitted. Wireless telephony was tested on a number of ships but did not prove a valuable or satisfactory means of communication.

An interesting feature of the year was the general increase of long distance work and numerous cases of trans-Pacific communications were reported, and ships in the vicinity of the Hawaiian Islands exchanged messages with Farallon Islands, Cal. During the cruise of the Atlantic fleet around the world, messages were received across Central America by Pensacola and Washington, and by a system of relays the fleet was in touch with Washington on the trip across the Pacific practically at all times until after New Zealand was reached.

1908-1909

A station was erected and put in operation at Cordova, Alaska.

During this period a contract was entered into for the construction of a high-power station to be located in Washington; this station to have a radius of 3000 miles both by day and night; to be capable of overcoming interference and static disturbances and to be equipped with apparatus to insure secrecy of operation. Though rapid strides had been made in the art it was confidently hoped that those conditions could be fulfilled. Later developments proved that such could not be entirely accomplished; that is, the conditions as to the elimination of static disturbances and complete secrecy of communication. Part of the same contract provided for the installation of two similar sets of apparatus of lesser power on two scout cruisers and the flagship of the Atlantic fleet.

The message work of the coast stations continued to increase at a great rate and particularly with merchant vessels which were rapidly being fitted with radio apparatus. As the coast service was free, the greatest advantage was taken of this service.

The state of the wireless communication was fast becoming one of chaos with the great increase of private and commercial shore stations, ship and amateur installations, and the question of elimination of interference was one always uppermost in the minds of those trying to control the situation. Many semi-intelligent and wholly irresponsible operators employed or otherwise engaged in this occupation, who at any time through carelessness or stupidity might render hopeless the case of a shipwreck, made it imperative that laws governing the conduct of all

radio stations should be passed. This was made the subject of many reports and repeated recommendations to adopt the terms of the Berlin Convention of 1906 went unheeded.

1909-1910

The year previous brought into the market the so-called high-frequency wireless apparatus, which, with the adoption of the quenched spark gap, did much to improve the general efficiency of transmitting apparatus. High-frequency apparatus was purchased for a number of vessels and shore stations for tests, the result of which indicated that the work of coast stations could be much improved by the introduction of this apparatus. Improvements were also made in the antenna masts, and the substitution of steel for wooden masts became quite general.

Experimental work continued with high-power apparatus and with portable wireless sets for use with landing parties and as auxiliary to the main sending sets of ships. The apparatus intended for the projected high-power station at Washington was installed in an experimental station at Brant Rock, Mass., and experiments were carried out with the two scout cruisers *Salem* and *Birmingham* which were fitted with similar apparatus of reduced power.

On account of lack of funds and inability to secure a proper site, work on the high-power station at Washington was not started. A modern medium high-power station was installed at Colon and stations of similar power were projected for Key West and on the island of Porto Rico. The installation of ships were improved as funds allowed, and all newly commissioned ships were furnished with the latest up-to-date apparatus.

1910-1911

The year 1910 saw the first Act of Congress bearing on the subject of wireless transmission enacted into law, and though it did not relate to wireless installations on government vessels, its passage was considerably due to the activities of officers of the Navy Department who had for years seen the necessity of some form of legislation to control the fast expanding system and to intelligently regulate its use as one of the greatest factors in safety at sea.

This Act of June 24, 1910, related to the equipment of ships leaving American ports with wireless apparatus and operators therefor. This was later amended by the Act of Congress approved July 23, 1912.

The Act of 1910 is believed to be the first recognition by this or any other government of the necessity of control over wireless installations, and this year marks an important step in the development of the art.

A site for the Washington high-power station was finally selected and a portion of the Fort Myer Military Reservation was set aside for the purpose, and contracts for the towers and buildings were let.

The necessity for stations on outlying islands in Alaska, principally for the business of the Department of Commerce and Labor, the Department of Agriculture and the Treasury Department became apparent, and preparations were begun for their erection and installation. Material for three new stations was assembled at Mare Island and embarked on the *Buffalo* with a working party from the navy yard. At the close of the fiscal year a temporary station at Kodiak had been completed and a temporary station at St. Paul, Pribilofs, and a permanent one at Unalaska were in course of erection. These stations handle business for all departments of the government and are of great assistance to commercial interests in transmitting commercial business to stations on the line of the Washington and Alaska Military Cable.

Steps were taken to select sites for important stations in Porto Rico; on the Island of Tutuila, Samoa; and at the Naval Station, Pearl Harbor, Hawaii.

Continued experiments were made on the development of reliable portable wireless sets for communicating uses for submarines, aeroplanes, landing parties and in special uses between a ship and its boats.

The necessity was recognized for a low-power, limited-range fog-signal wireless installation for ships, wireless stations, lighthouses and light-ships and special attention was paid towards the development of portable sets for this purpose.

1911-1912

Most of the year's work was concentrated on modernizing old installations in ship and shore stations, which the introduction of

the high-frequency, quenched-gap apparatus made possible. All new ships were so equipped and as many of the older ships as the funds on hand allowed.

The work on the high-power station at Washington continued and rapidly approached completion.

The great *Titanic* disaster of April, 1912, rivetted the attention of our law makers anew to the absolute necessity of government control over radio apparatus and its operation. Up to this time the United States had not become a signatory party to the Berlin Convention, but the benefits to be derived were clearly shown by the great disaster, and the convention was proclaimed on May 25, 1912, by the President to the end that, " every article and clause thereof may be observed and fulfilled with good faith by the United States and its citizens thereof."

NOTE.—This convention is superseded by the terms of the London Convention, proclaimed by the President, and in so far as it does not conflict with existing law, becomes the law of the land.

1912-1913

In the summer of 1912 another expedition was fitted out at Mare Island for a trip to Alaska to refit certain stations and to erect others that experience proved necessary. An expedition left Mare Island on the *Nero* on May 20, 1912, and returned on November 23, 1912. During this period a modern medium power station was built at Unalga. A station was built at St. George, Pribilofs, as an auxiliary to the one at St. Paul, built in 1911. The station at Kodiak which had only been built the year before had been totally destroyed by volcanic eruption and it was rebuilt. The stations at Dutch Harbor (Unalaska), St. Paul, Cordova and Sitka were all refitted and brought up to date with modern apparatus.

The high-power station at Arlington was completed and put in successful operation in the fall of 1912. The apparatus installed there was the 100 k. w. set of the National Electric Signaling Company that had previously been used at Brant Rock, Mass.

In the spring of 1913 the coast station at Balboa on the Pacific side of the Isthmian Canal Zone was erected and put in operation. A station was also erected on the grounds of the American legation in the city of Peking, China, for communication between officials of the United States Legation and vessels of the Asiatic

fleet. A station was erected at Port Royal, S. C., in connection with the Disciplinary Barracks at that place, to be used in connection with prisoners held on probation who may show aptitude as radio operators, and is not used for any official or commercial business.

The Act of Congress of August 22, 1912, contained this provision:

> Toward the purchase and preparation of necessary sites, purchase and erection of towers and buildings, and the purchase and installation of machinery and apparatus of high-power radio stations (cost not to exceed one million dollars), to be located as follows: One in the Isthmian Canal Zone, one on the California coast, one in the Hawaiian Islands, one in American Samoa, one on the island of Guam, and one in the Philippine Islands, four hundred thousand dollars, to be available until expended.

In accordance with the authority contained in the above Act the Navy Department entered into a contract with the Federal Telegraph Company of San Francisco for the erection of a high-power station in the Isthmian Canal Zone. This station is to be of 100 k. w. power with transmission apparatus of the arc system, commonly known as the Poulsen system, sending out continuous undamped waves. There will be three 600-foot steel towers for the support of the antennæ. This station will be erected in a location about half way across the Isthmus near San Pablo and along the route of the canal. The name given to it, Darien, retains the name of one of the early explorers in those regions, and with Colon on the Atlantic side of the canal and Balboa on the Pacific, the names of the first European explorers in the region of the canal are perpetuated in the names of the three radio stations.

The contract calls for the completion of the Darien Station within ten months from the time of signing the contract, in June, 1913.

Preliminary arrangements were made to locate sites for the other high-power stations authorized, and their erection will be pushed to completion after tests with the Darien Station have been made. The site for the station on the California coast was tentatively decided upon in the vicinity of San Diego, and the definite location was considered by a special commission. This commission was also authorized to look into a site for a proposed station near the mouth of the Rio Grande River, and near the town of Isabel, Texas.

Consideration was given to the erection of a moderately high-power station at the Training Station, Great Lakes.

The station at Cape Henlopen was abandoned in the spring of 1913, as the service formerly performed by it could be better taken care of by the station at Philadelphia (navy yard), at which a more powerful set was installed.

1913-1914

This was a period of great unrest in Mexico which necessitated the keeping of a large number of national vessels in Mexican waters. As many land telegraph lines in Mexico could not operate owing to the internal troubles of the country, advantage to a great extent was taken of the ships' radio installations for the transmission and reception of messages to and from distant radio stations which are connected to land lines of this country, and the naval radio service met very fully all the demands made on it. On the Atlantic side, the necessity of a shore station on the Gulf of Mexico as far south in the United States as possible was recognized and the erection of a station at Isabel, Texas, near the mouth of the Rio Grande, was hurried, the site procured and arrangements made for the necessary apparatus. The judgment of having a high power station near San Diego was confirmed and a site for this station was definitely decided on and will be acquired as soon as possible.

During this period a small radio station on Yerba Buena Island was reestablished for the sole purpose of instruction of enlisted personnel. This is not a transmitting station, except in emergencies and in special cases authorized by the commandant of the station.

In a matériel sense the development was generally along the lines of increased sensitiveness of receivers, made possible by the introduction of amplifiers which served to increase very materially the reception of otherwise weak signals. Such devices as the heterodyne and the audion cause weak signals to be magnified so that their reception is made much easier, and this has the same effect as increasing the range of audibility of signals, which in the past was accomplished by more powerful transmitting apparatus.

A matériel feature that served to increase the operating efficiency was the development of a quick wave-changing device, by

which an operator could perform all the adjustments necessary when making a change from one wave length to another by the simple operation of moving a switch without altering his position at the operating key.

ADMINISTRATION

On August 13, 1912, Congress passed an Act entitled, "An Act to regulate radio communication," which became effective December 13, 1912. This was of far reaching importance and related to the control of all private radio stations, both on ship and on shore, as well as to the operation of all government stations.

Reference to Article 18 of this Act will show that provision is made for the opening of certain government shore stations to commercial business under the terms of the Berlin Convention of 1906, or future international conventions to which the United States may be a party. The provisions of this article coupled with the rapidly growing importance of radio communication in the fleets and in general between shore and ship impelled the Navy Department to establish an office whose sole duties are devoted to the administration and executive control of its radio service. The Office of Superintendent of Naval Radio Service was established by Navy Department General Order No. 240 of November 9, 1912, with headquarters at the Radio Station, Arlington, Va. This office, among other things, is charged with:

(1) The preparation of regulations and issue of detailed instructions for the operation of stations in accordance with military efficiency, international agreements in force, and the laws affecting the operation of naval radio stations.

(2) Control of the commercial work handled by naval radio stations, including issue of accounting and operating forms, auditing commercial accounts, traffic agreements, and accounting with commercial and other government managements involved.

The superintendent is authorized to correspond directly within the naval service in accordance with the procedure laid down by the Regulations in the case of bureaus and other offices under the Navy Department in regard to all matters in which he is authorized to take action, directly with private and commercial concerns upon matters of reciprocal interest relating to the commercial operation of naval radio stations in questions of interference, traffic arrangements, proposed charges of rates, and accounting.

The superintendent of Naval Radio Service is charged with all matters pertaining to the operation of radio apparatus ashore and afloat except certain technical operations assigned to the control of the Bureau of Steam Engineering. This executive control as far as it relates to operation extends to the radio installations on all ships of the navy, and to the following shore stations, which includes all those now in active operation:

Portland, Me.,
Portsmouth, N. H.,
Boston, Mass.,
Cape Cod, Mass.,
Nantucket Shoals Light-ship,
Newport, R. I.,
Fire Island, N. Y.,
New York, N. Y.,
Philadelphia, Pa.,
Annapolis, Md.,
Washington, D. C.,
Arlington, Va.,
Norfolk, Va.,
Diamond Shoals Light-ship,
Beaufort, N. C.,
Frying Pan Shoals Light-ship,
Charleston, S. C.,
St. Augustine, Fla.,
Jupiter, Fla.,
Key West, Fla.,
Pensacola, Fla.,
New Orleans, La.,
San Juan, P. R.,
Guantanamo Bay, Cuba,
Colon, Panama,
Porto Bello, Panama,
Balboa, I. C. Z.,
St. Paul, Pribilofs, Alaska,
St. George, Pribilofs, Alaska,
Unalga, Alaska,
Dutch Harbor, Alaska,
Kodiak, Alaska,
Cordova, Alaska,
Sitka, Alaska,
Bremerton, Wash.,
Tatoosh, Wash.,
North Head, Wash.,
Cape Blanco, Oregon,
Eureka, Cal.,
Mare Island, Cal.,
Farallons, Cal.,
Point Arguello, Cal.,
San Diego, Cal.,
Honolulu, Hawaii,
Guam,
Cavite, P. I.,
Olongapo, P. I.,
Peking, China.

The control of the various radio stations as regards their administrative and operative features, as well as their inspection and maintenance, is vested in the commandants of the several naval stations, subject to Navy Regulations, general orders, and instructions prepared in the office of superintendent of Naval Radio Service.

The following table shows under whose direct control the various stations are placed:

Commandant, Navy Yard, Portsmouth, N. H.
    Portland, Me.,
    Portsmouth, N. H.
Commandant, Navy Yard, Boston, Mass.
    Boston, Mass.,
    Cape Cod, Mass.

Commandant, Naval Station, Narragansett Bay, Newport, R. I.
Newport, R. I.,
Nantucket Shoals Light-ship.
Commandant, Navy Yard, New York, N. Y.
New York, N. Y.,
Fire Island, N. Y.,
San Juan, P. R.
Commandant, Navy Yard, Philadelphia, Pa.
Philadelphia, Pa.
Superintendent, Naval Academy.
Annapolis, Md.
Commandant, Navy Yard, Washington, D. C.
Washington, D. C.
Superintendent, Naval Radio Service.
Arlington, Va.
Commandant, Navy Yard, Norfolk, Va.
Norfolk, Va.,
Diamond Shoals Light-ship,
Beaufort, N. C.
Commandant, Navy Yard, Charleston, S. C.
Frying Pan Shoals Light-ship,
Charleston, S. C.,
St. Augustine, Fla.,
Jupiter, Fla.,
Pensacola, Fla.,
New Orleans, La.
Commandant, Naval Station, Guantanamo Bay, Cuba.
Guantanamo Bay, Cuba.
Commandant, Naval Station, Key West, Fla.
Key West, Fla.
Superintendent of Transportation, Isthmian Canal Zone.
Colon, Panama,
Porto Bello,
Balboa,
Darien.
Commandant, Navy Yard, Mare Island, Cal.
Mare Island, Cal.,
Farallons, Cal.,
Point Arguello, Cal.,
San Diego, Cal.,
Eureka, Cal.,
Cape Blanco, Wash.,
North Head, Wash.,
Sitka, Alaska,
Cordova, Alaska,
Kodiak, Alaska,
Dutch Harbor, Alaska,
St. Paul, Pribilofs, Alaska,
St. George, Pribilofs. Alaska.

Commandant, Navy Yard, Puget Sound, Wash.
Bremerton, Wash.,
Tatoosh, Wash.
Commandant, Naval Station, Hawaii.
Honolulu, Hawaii.
Commandant, Naval Station, Guam.
Guam.
Commandant, Naval Station, Olongapo, P. I.
Cavite, P. I.,
Olongapo, P. I.
Commander-in-Chief, Asiatic Fleet.
Peking, China.

WORK OF NAVAL SHORE STATIONS.

Primarily every naval shore station was built to satisfy a military necessity and to form a link in the chain of communication by which the Navy Department is enabled to keep in touch with its ships at sea, either by direct or relayed messages. This service extends to all bureaus, offices and divisions of the Navy Department as well as to their different representatives in navy yards and stations, and to officers in command of fleets, divisions and ships.

Besides this purely naval work, the stations are available for the transmission of messages relating to the business of all departments of the government that involves shore to ship or ship to shore work.

TIME SIGNALS

The transmission of time signals to vessels at sea by means of radiotelegraphy was first accomplished in the United States in 1905 and this service, enlarged and extended, has continued to the present time. This service is of the greatest value to mariners, as it allows a means by which the transmitted signals may be compared with a ship's chronometer and the error of the chronometer found. Similar comparisons over a number of days enable data to be obtained by which not only the error may be found but also the chronometer rate; that is, the rate at which it is gaining or losing.

The noontime signal on the Atlantic coast is sent out through the coast stations by connection with Western Union telegraph lines from the U. S. Naval Observatory at Washington, D. C. By the operation of proper relays in electrical circuits the beats of the seconds of a standard clock in the Observatory are sent out broad-

cast as a series of radio dots commencing five minutes before the time of the final signal and by omitting certain dots in a series, the comparison between the dots and the beats of the chronometer seconds can be checked until the instant of local noon, 75th meridian time is reached. This is marked by a longer dot, the instant of closing the circuit to make this dot being the time of exact noon. A comparison of the chronometer time at that instant gives its error on 75th meridian time, and applying the difference in longitude, five hours, between the 75th meridian and Greenwich, the standard meridian, or 0° longitude, the error of the chronometer on Greenwich mean time is determined. Time signals are now sent out on the Atlantic coast only through the radio stations at Arlington, Key West and New Orleans. Signals from Arlington which reach a zone formerly served by other coast stations, are sent out every day in the year, twice a day; viz., at noon and at 10 p. m., 75th meridian time. Time signals from Key West and New Orleans are sent out daily, including Sundays and holidays, commencing 11.55 a. m., 75th meridian time, and ending at local noon.

In case of failure of the Arlington high powered station for any cause, the signals are sent out by the small set in the same station, and the stations at Boston, Newport, Norfolk and Charleston are notified, and they each send broadcast the signals.

On the Pacific coast, time signals are sent broadcast to sea through the naval radio stations at Mare Island, Eureka and San Diego in California and at North Head, Washington. The controlling clock for each station is in the Naval Observatory at the Mare Island Navy Yard. Signals from Mare Island are sent out every day from 11.55 to noon and from 9.55 to 10.00 p. m., 120th meridian standard time; those from North Head, Eureka and San Diego are sent out daily, except Sundays and holidays from 11.55 a. m. to noon, 120th meridian standard time.

It is not necessary that an elaborate radio installation be employed for the purpose of receiving these signals, nor that a skilled operator be in attendance. Any vessel provided with a small receiving apparatus with one or two wires hoisted as high as possible and insulated from all metallic fittings, or preferably stretched between the mastheads with one wire led down to the receiver, may detect these signals when within range of one of the seacoast radio stations. To get the best clearness of signals,

the receiving circuit should be tuned to that of the sending station. Arlington and Mare Island send on a 2500 meter wave. North Head and San Diego on a 2000 meter wave. Eureka on a 1400 meter wave and Key West and New Orleans on a 1000 meter wave.

WEATHER REPORTS

Through co-operation with local offices of the U. S. Weather Bureau, weather forecasts are sent broadcast to sea through naval coast radio stations at certain times which vary with the locality. Coast stations are generally prepared to give local forecasts to passing vessels without charge on request. Storm warnings are sent whenever received.

Since July 15, 1913, a daily weather bulletin has been distributed by the naval radio stations at Arlington, Va., and at Key West, Fla., a few minutes after the 10 p. m. time signal.

The daily bulletin consists of two parts. The first part contains code letters and figures which express the actual weather conditions at 8 p. m., 75th meridian time, on the day of distribution at certain points along the eastern coast of North America; one point along the Gulf of Mexico, and one at Bermuda. The second part of the bulletin contains a special forecast of the probable winds to be experienced a hundred miles or so off shore, made by the U. S. Weather Bureau for distribution to shipmasters. The second part of the bulletin also contains warnings of severe storms along the coast as occasion may arise.

The points for which weather conditions are furnished are designated respectively by their initial letter, except in the case of Nantucket, for which the letter T is used; accordingly, S, Sydney; A, Atlantic City; H, Hatteras; C, Charleston; K, Key West; P, Pensacola, and Br, Bermuda.

The report is made by means of a special code furnished to mariners, and is followed by a general forecast for different zones of the coast. With the information contained in these broadcast messages, mariners should be able to make their own forecasts in addition to that given by the official forecaster at the headquarters of the Weather Bureau at Washington.

Preliminary arrangements have been made by which weather reports will be exchanged between a Russian station at Anadyr, Siberian Russia, and Alaskan naval stations. This weather reporting service will also be enlarged to include reports from

various stations in the West Indies which will be sent out from the high power station at Darien, on the Canal Zone, for the benefit of ships in the Caribbean and on the Pacific side which may be in transit to or from the Panama Canal.

HYDROGRAPHIC INFORMATION

Information concerning wrecks, derelicts, ice and other dangerous obstructions to navigation whenever received from the Hydrographic Office or from a branch hydrographic office is sent broadcast from naval radio stations four times daily; viz., at 8 a. m., noon, 4 p. m., and 8 p. m., local (standard) time of station. Ships within range of such stations should be prepared to receive these hydrographic messages at the hours mentioned, and should avoid sending at these times. One vessel sending may prevent several others receiving information necessary to their safety.

Naval stations will furnish information to passing vessels on request whenever practicable at other hours than those mentioned above.

The International Convention on Safety of Life at Sea, which convened in London on November 12, 1913, invited the Government of the United States to undertake the management of the services of derelict destruction, study and observation of ice conditions and ice patrol in the North Atlantic. By this convention the master of every ship which meets with dangerous ice or a dangerous derelict is bound to communicate the information by all means at his disposal (the principal of which will be the wireless installation) to the ships in the vicinity, and also to the competent authorities at the first point of the coast with which he can communicate. This information will be forwarded to the Hydrographic Office, New York, and there made known to maritime exchanges and further will be forwarded to the headquarters at Washington to be broadcasted to sea from the Arlington radio station following the time signal and weather reports. At such times ships are listening on the long wave of Arlington, 2500 meters, and their receiving circuits will be tuned to receive the ice or derelict reports. In order to prevent delay in having such information reach as many ships as possible, the coast stations which first receives the information will at once broadcast it, and with the increased power, should reach ships that could not be reached by the first reporting ships.

Another provision of the convention requires that every ship fitted with a radio telegraphic installation which becomes aware of the existence of an immediate and serious danger to navigation, shall report it immediately to the Hydrographic Office, Washington, or to the Hydrographic Office, London. Such information reaching the Hydrographic Office, Washington, will be broadcasted through appropriate naval stations. The reporting of information concerning ice and derelicts is *compulsory* under the terms of the London Safety Convention, the reporting of information relating to weather is voluntary. Information can be forwarded either in full or by means of a code adopted by the convention.

The radio stations which have to transmit to ships information involving safety of navigation and being of an urgent character (icebergs, derelicts, cyclones, typhoons, sudden changes in the position or form of fixed obstructions or of land marks) are required to make use of the following signal, called the safety signal, repeated at short intervals ten times at full power — — — (T T T). All radio stations receiving the safety signal are required, if the transmission of messages by them would interfere with the receipt of any other station of the safety signal and the following safety message, to keep silence, in order to allow interested stations to receive that message.

The safety message will be transmitted one minute after the safety signal has been sent out and should be repeated thereafter three times at intervals of ten minutes.

The above information will be sent out by naval stations as soon as it reaches them, and again later by such stations that transmit time signals and will follow the weather reports.

GENERAL SHIP TO SHORE WORK

The installations of the naval coast stations, including those on the light-ships on Nantucket Shoals, Diamond Shoals and Frying Pan Shoals are placed at the service of the public generally and of maritime interests in particular for the purpose of:

(a) Reporting vessels and intelligence received by radio telegraphy with regard to maritime casualties, derelicts at sea, overdue vessels, and the reporting of all matters pertaining to ships in distress.

(b) Receiving radiograms of a private or commercial nature from ships at sea, for further transmission by telegraph, telephone or cable lines.

(c) Transmitting radiograms to ships at sea from inland points.

Information contained under heading (a) is transmitted free of all costs as far as radio charges are concerned. Headings (b) and (c) relate entirely to commercial work and will be considered separately.

Light-ship stations are authorized to transmit reports received from masters of passing vessels to their owners, agents, or maritime agency to the nearest naval radio station without charge, but in all such cases arrangements must be made by such owners or agents for the forwarding of messages by land telegraph from the coast station to point of destination.

Light-ships display storm warnings when information regarding such is furnished them from the Weather Bureau by means of radiograms through coast stations. Ship owners desiring to use any special code of signals for communicating with light-ships fitted with radio apparatus to be by them transmitted to shore and then to destination may make special arrangements with the Navy Department, Superintendent of Naval Radio Service.

The radio service connected with the transmission is free, but arrangements must be made with land lines for the forwarding charges.

FOG SIGNALS AND DIRECTION FINDERS

The naval radio service is engaged in making experiments with radio installations that may be of value in case of fog or thick weather. Certain shore stations which may or may not be radio stations are fitted with small automatic sending apparatus, which may be set in operation in time of fog or thick weather by anyone unskilled in the art of transmitting radio signals. This apparatus will transmit by means of radio apparatus dots and dashes the distinctive signal of the station, and will correspond to the sound signals emitted by the ordinary fog signals. These radio signals will be sent with very low power and on a short wave length so their range of transmission will be comparatively short, but considerably longer than the ordinary range of the sound signal. These signals will be of help in picking up a shore

station, as the radio signals will be heard further than the sound signals, and an estimate of the distance may be made. It is so arranged that the same operation that closes the circuit for making radio signals acts to operate the sound signal, and by noting by a stop watch, the interval between the time of the reception of the radio signal and the sound signal, and knowing the relative velocities of the electric and sound waves, a very close approximation of the distance can be made.

There are two general classes of radio direction finders. One of these requires special apparatus on shipboard with no special apparatus on shore other than the ordinary transmitter, the other system requires special apparatus on shore and no special apparatus on board ship other than the ordinary radio receiver and a stop watch.

In case of fog the first system may be made use of when radio signals of any description are heard from a shore station, a system of moving coils in connection with a special ship's aerial, giving a means of determining the bearing of the shore station at a certain time. After a given run of the ship another hearing can be obtained, and knowing the course and distance run, a close approximation to the ship's position can be obtained. The second system requires special antennæ at the shore station, umbrella type, one lead running north and south, the others in a direction corresponding to the points of the compass. Signals are sent out broadcast through each wire of the antennæ in succession and the received signals on shipboard are of greater or less intensity depending upon the particular section of the antennæ, being greatest through the section which most nearly corresponds to the bearing of the ship, or 180° from it. There is a distinctive signal transmitted through the north section of the antennæ, and when this is heard a stop watch on board ship is started and this is stopped when the received signal becomes of the greatest intensity. This furnishes a ready means of obtaining the bearing of the shore station or the 180° from it, and the real bearing should readily be known.

COMMERCIAL WORK OF NAVAL COAST STATIONS[1]

Under the authority contained in article 18 of the Radio Act of August, 1912, the following shore stations are now opened for the transmission of commercial business between ship and shore, and shore and ship:

Charleston, S. C.,
St. Augustine, Fla.,
Jupiter, Fla.,
Pensacola, Fla.,
Key West, Fla.,
Guantanamo Bay, Cuba,
San Juan, P. R.,
Colon, R. P.,
Balboa, I. C. Z.,
Tatoosh Island, Wash.,
North Head, Wash.,
Cape Blanco, Oreg.,
Eureka, Cal.,
Point Arguello, Cal.,
San Diego, Cal.,
Guam,
St. Paul, Pribilof Islands, Alaska,
St. George, Pribilof Islands, Alaska,
Unalga, Alaska,
Dutch Harbor, Alaska,
Kodiak, Alaska,
Cordova, Alaska,
Sitka, Alaska.

By Navy Department General Order No. 10 of February 7, 1913, the radio stations on board all vessels of the navy were opened to general public service, under certain restrictions, for the accommodation of officers and crews of such vessels. The restrictions in this service vary in the different fleets and the service is subject to the general control of the senior officer present afloat.

Commercial work handled by naval radio shore stations is conducted entirely in accordance with the provisions of statute law, and of international conventions which have been ratified by the Senate of the United States and proclaimed by the President. Until September 1, 1913, this service was conducted under the terms of the Berlin Convention, on which date the terms of the London Radiotelegraphic Convention became effective.

In general, commercial work involves only plain ship to shore, shore to ship, or ship to ship work, but relaying is allowed under certain conditions. Communication for commercial work from point to point, that is, from one coast station to another by radio is not contemplated by the convention.

[1] Most of the matter contained under this general heading is taken from the Handbook of Regulations, United States Naval Radio Service, 1913, which was prepared in the Office of the Superintendent Naval Radio Service. It is made a part of this article in the hope of reaching a class of readers to whom the Handbook is not available.

RELAYING

Messages are entitled to be relayed under the following conditions:

(a) In case direct communication cannot be established between the station of origin and destination.

(b) In case the relaying is solely for the purpose of reaching the nearest coast station (of messages originated on a ship).

(c) In case the relaying ship or station is in position to forward the message.

(d) In case the total number of relays does not exceed two. Messages originating on a ship may be relayed to another ship by means of:

(1) One or two ships.

(2) A coast station.

(3) Two coast stations and then connecting telegraph lines. Messages from shore may be relayed to a ship by another ship, but only in case the sender has specifically demanded such relay and the preamble contains instructions as to the number of relays which must not exceed two.

In cases of relaying to a ship at sea, the coast station forwards the message by one or two relay ships and then notifies the office of origin what the amount of relay charges is, that they may be collected of the sender. All relay charges must be *prepaid as must all other charges on radiograms.* There is but one charge per station allowed; that is, the reception and retransmission is made a single—not a double—charge. The naval radio service makes no charge for relaying messages, nor do certain of the commercial companies, notably the Marconi Wireless Telegraph Company and their affiliated companies.

COUNTING OF WORDS AND CHARGES

The cable count is used on all radiograms; that is, every word of the address, message and signature is counted and paid for at a certain rate per word, though every radiogram carries a minimum charge which is equal to that of a 10-word radiogram. Where transmission is effected partly over cables, only the actual number of words is charged and paid for the transmission. The address must contain at least two words, one of which must be the coast station through which the message is transmitted, but

a signature is not necessary, and there is no limit to the number of words in the message.

Messages may be sent from vessels at sea through certain naval coast stations to any point or destination reached by telegraph, cable or telephone lines, or intended for local delivery, and similarly messages may be filed locally or sent from any land point by telegraph, cable or telephone lines to coast stations for transmission to vessels at sea.

The maximum charge allowed by the London Convention is 60 centimes (about 11.6 cents) per word for coast stations and 40 centimes (about 7.7 cents) per word for ship stations. The rate fixed for naval coast stations is 6 cents per word for all stations except Guam (5 cents) and the stations at North Head, Washington, and Eureka, California, which have the 6-cent rate for plain ship to shore work, but which apply special rates on radiograms to or from Alaskan stations.

The ship rate for naval vessels is 4 cents per word on all commercial messages intended for ships; on such messages from officers and crew of a ship there is no ship charge. The ship rate of commercial vessels is fixed by the companies operating the radio installations, and these rates vary with the service the vessel is engaged in and the character of the voyage.

The coast station rate is practically the same as the rate of commercial companies doing the same class of work. If the rate was higher, the service would not offer the same accommodation to the travelling public, and if lower, would have the effect of competing with commercial companies something which it is not assumed that the law contemplates.

CLASSES OF MESSAGES

For the purpose of identifying and properly accounting for the many different kinds of messages that are handled by ship and shore stations, messages are grouped by classes, and each is given a special prefix which determines its final accounting.

These are:

Class A, OFM, Official Business, Navy Department.

Class B, OFM, Official Business, other departments of the government than Navy Department; foreign government ships or stations.

Class C, OFM, Hydrographic and weather reports.

Class D, RADIO, Commercial.
Class E, MSG, Unofficial, authorized messages (not service messages).
Class F, PU, Urgent personal.

A special prefix SVC is used on service messages between operators concerning the handling of radiograms and this prefix is used to obtain or impart information relative to the handling of messages, to accounts, rates, traffic arrangements, schedules, tests and generally the despatches of business, official and commercial.

The official business of the Navy Department (Class A) embraces all the business connected with all bureaus, offices and divisions or subdivisions of the department in Washington, or their representatives in the various navy yards and stations, official communication between ships of the navy, and generally between all persons in the naval service on purely official business. Messages from officials of all other departments of the government who have occasion to send official messages to their own or other departments through naval coast stations are grouped as Class B. These embrace officials of the Revenue Cutter Service, Army Transport Service, Lighthouse Service, Department of Commerce through their radio inspectors, and other officials of various branches of the government who may have occasion to send messages to or from ships at sea.

Class C messages embrace all hydrographic and weather reports to and from ships at sea.

Class D messages are strictly commercial and carry the prefix RADIO. Special classes will be referred to later.

Class E messages with special prefix MSG are authorized for unofficial radiograms by flag or commanding officers' personal use. They must involve no land line transmission, unless it be delivered by telephone to a local address, one which involves no tolls for telephoning. Under certain conditions the commanding officer may authorize the sending of Class E messages by other persons on board, to be sent to the nearest naval coast station, with the same restrictions as to connecting line charges as mentioned above. Class E messages cannot be sent to a ship or station operated by commercial companies.

Class F messages were established for the purpose of giving officers and crews of naval vessels special facilities in sending messages in which land line transmission is involved, to their families and friends, relating to matters of an urgent personal

nature, concerning death, serious illness or accident. Messages on semi-official business, as requests for leave or change of duty, are also allowed under this class.

These messages may be sent through naval ship and coast stations only, whether open to public business or not. In all cases they must originate on board ship; messages of a similar character originating on shore are Class D messages, strictly commercial.

On Class F messages there are no radio charges, either ship or station, but land line tolls must be fully prepaid. These charges are computed by cable rules, ten word minimum, the same as for commercial radiograms. They may be relayed only as far as necessary to reach the nearest naval radio coast station in the continental limits of the United States. They must be duly authorized by the senior officer present and sent at such times as he may direct. Land line charges must be fully prepaid on board ship. Replies to Class F messages, if by radio, must be made through stations open to commercial business, commercial or naval, and the station and ship rate must be applied.

SPECIAL CLASSES OF COMMERCIAL RADIOGRAMS

Additional to the regular type of commercial prepaid message the special types given below are authorized. The following list gives the names of the special types and also the abbreviated designations by which they are known:

Classes of Messages	Designations
Radiograms with answer prepaid (on land lines "Reply Prepaid")	RP
Radiograms calling for repetition of message (on land lines "Repeat Back")	TC
Special delivery radiograms	EXPRESS
Radiograms to be delivered by mail	POST
Radiograms to be delivered by registered mail	PR
Multiple radiograms	TM . . x . .
Radiograms calling for acknowledgment of receipt	PCP (by mail) / PC (by telegraph)
Acknowledgment of above	CR
Paid service notice	RADIO ST (prefix)
"Ocean Letters" or radiograms to be mailed by a ship at a port of call	POSTE (in address)

The following types of messages are not allowed as radiograms:

Telegraph money order.

Telegrams at reduced rates for night letters, deferred cablegrams, etc.

Urgent telegrams, to take precedence over regular telegraphic traffic.

The last class, "Urgent telegrams," is allowed on European systems, but not in North America.

INSTRUCTIONS CONCERNING SPECIAL CLASSES OF RADIOGRAMS

RADIOGRAMS WITH ANSWER PREPAID

These contain the abbreviated instruction "RP....," the dots standing for the amount paid for return message. This expression is transmitted in two places, and is charged for once, "RP...." (including the amount) is counted in the check as ONE word. In sending by radio to foreign ships, the amount must be expressed in francs, based on a value of 20 cents to a franc. On land lines of the United States the value of the reply is expressed by the ***number of words*** prepaid for such reply. To conform to international agreements, this number of words is translated at a coast station to the corresponding money value equivalent to the number of words. Similarly when received from ships with a given amount of money expressed, the coast station, before forwarding to the land line, converts the amount into its equivalent of so many words.

The receiver of a reply prepaid message is given a voucher equal in value to the amount prepaid for reply. This voucher is good for six weeks. It should be carefully noted that the receiver of such a message on shipboard is not bound to send a reply to the sender of the original message, but may apply the value of his voucher to the payment of *any* message he wishes to send.

RADIOGRAMS CALLING FOR REPETITION OF MESSAGE

Such repetition is for the purpose of verification only. In this case the expression "TC" or the words "repeat back" are used. This expression is transmitted in two places and is charged for once as ONE word. In this case the message is repeated back by each station that handles it to the one before. The additional charge for repeating back is one-fourth of the regular tolls.

SPECIAL DELIVERY RADIOGRAMS

These are messages which involve delivery beyond the limits of a telegraph office, which is accomplished by telephone or messenger. The International Convention stipulates that these shall

be accepted only in cases where the charge for special delivery is paid by the addressee. The special prefix for this class of messages is "EXPRESS," which is transmitted in two places and is charged for as ONE word.

RADIOGRAMS TO BE DELIVERED BY MAIL

These are distinguished by the service instruction "POST" transmitted in two places and charged for once as ONE word. When such a radiogram is received at a coast station, it is sent by mail to the addressee, or if the name of some other place follows the word "POST" it will be forwarded by land line to that place with the instruction "mail." It is then mailed from the telegraph office to which forwarded. In addition to the extra charge for the word "POST" there is an additional charge collected from the sender of 5 cents for postage, and if the expression "PR" is used instead of "POST" it signifies that the letter is to be forwarded by registered mail which carries a collection from the sender of 15 cents instead of five cents.

MULTIPLE RADIOGRAMS

By a multiple radiogram is meant one message addressed either to several persons, or to the same person at several addresses, in the same locality or in different localities served by the same telegraph office. Such messages contain the abbreviation "TM . . x" ("x" standing for the number of different addresses). This is transmitted in two places and in the address is counted in the check for radio transmission. It is not forwarded over the land lines in the United States; therefore, such a message is charged for as so many different messages as far as land line transmission is concerned, and is so put on the land lines. Such a message is received by the coast station as one radiogram with multiple address, and it is there sent out as separate messages, each with its own address, the body of the message being repeated in each.

RADIOGRAMS CALLING FOR ACKNOWLEDGMENT OF RECEIPT

Such acknowledgment is limited to notification of the date and hour at which the coast station shall have transmitted the radiogram to the ship to which it was addressed. This notification is sent to the office of origin either by telegraph or mail, at the option of the sender of the message. The instruction to send acknowl-

edgment of receipt is transmitted by the letters "PC," or the words "Acknowledgment Paid" as supplementary instructions at the end of the preamble, and also as the first item of the first address. The letters "PC" in the address are counted in the check charged for as one word. This calls for telegraphic acknowledgment by mail, and are charged for as one word. Should the expression "Acknowledgment Paid" be written on the blank, it shall be transmitted by the abbreviation.

If telegraphic acknowledgment is requested, the sender of the message is charged for a five-word telegram, by the same route. Mail acknowledgments are sent free. They are addressed to the telegraph office at which the message originated. Telegraphic acknowledgment is announced by service message containing the abbreviation "CR," followed by the name of the addressee, ship, the word "transmitted," and the hour and date.

PAID SERVICE NOTICES

These are service messages, *i. e.*, messages exchanged only between OFFICES (stations), whether radio or telegraph, sent at the request of a sender of a commercial message, and are charged for at regular rates. The London Convention prohibits paid service messages calling for repetition or information. Paid service messages are designated by the prefix "RADIO ST" instead of "RADIO." They may be sent for various reasons, as, to rectify or complete an address; to rectify or complete the text; to cancel a message.

OCEAN LETTERS

(Radiograms to be Mailed by a Ship at a Port of Call)

Radiograms may be transmitted by a coast station to a ship, or by a ship to another ship, to be forwarded by mail from a port of call of the ship receiving the radiogram. These are known as "Ocean Letters." Such radiograms are not entitled to any relaying by radio. The address of such a radiogram shall embrace the following:

(1) The paid designation "Poste" or (if sent to a U. S. ship) "Mail," followed by name of port at which message is to be mailed.

(2) Name and complete address of addressee.

(3) Name of station on shipboard by which radiogram is to be mailed.

(4) When necessary the name of the coast station.

The rate shall comprise, in addition to the radio and telegraph rates, the sum of five cents ($.05) for postage.

ACCOUNTING

The system of accounting in vogue follows the requirements of Article XLII of the Service Regulations affixed to the International Convention of London, 1912. This article requires that the accounts regarding radio charges shall be drawn up by the radio managements to which the coastal stations are subject. Coastal and shipboard charges do not enter into the accounts provided for by the International Telegraph Regulations.

The primary requirement in the transmission of all radiograms is the *prepayment* of all charges from point of origin to point of destination, and no "collect" radiograms of any class is recognized. All telegraph, cable and radio companies operating follow the same general system of accounting, which is, that the system on which a message originates becomes responsible for all the charges on said message, and that system collects full tolls and thereupon pays to the next connecting line its tolls plus all tolls due forwarding lines; in turn, the second system handling the message pays the third connecting line its tolls and all tolls due systems following that system.

Although the system on which the radiogram originates collects all tolls and is responsible for all charges beyond its system, the accounts are, in accordance with the Service Regulations, London Convention, drawn up by the radio management of the coast stations. This means that all the coast stations belonging to the Naval Radio Service which are opened to public general correspondence, draw up the accounts on all messages that pass through them, either from shore to ship, or from ship to shore.

The required prepayment from shore to ship includes land line or cable charges from point of origin to the coast station (or a message may be filed locally at a coast station, in which the above charges do not appear), the coast station charge and the ship station charge. If the message originates on ship and is destined to a shore point, the charges to be applied and paid on board ship are the ship's charge, the coast station charge and the land line or cable charges to destination. If destined to be delivered locally at the coast station, there may be no forwarding charges. Thus

on a message from an inland point to a ship at sea, the administration of the coast station charges the forwarding land line company which handed the message to it with its own station charge plus the ship station charge, and on collection turns over to the administration controlling the ship installation, the amount due it, retaining its own charge. Similarly on messages from sea the administration of the coast station through which the message passed charges the company controlling the ship installation with the shore station charge plus all forwarding charges due to land line or cable companies. On collection of these charges, the administration of the coast station turns over to the forwarding company its proportion of the charges and retains its own.

The general principle followed is that the coast station debits the company that handed the message to it, whether from ship or shore, with its own and all forwarding charges, and credits the proper companies with all charges beyond it. Thus in case a shore has no direct physical connection with a land telegraph or cable line, but is connected by means of a telephone line the administration of the coast station does its accounting with the company controlling the telephone line and turns over all forwarding charges to it, and this company in turn accounts with any further forwarding company, unless both telephone and telegraph lines are controlled by the same company.

Most naval coast stations in the continental limits of the country have direct connection with either the Western Union Company telegraph lines or Postal Company telegraph lines and some have both. In some instances there is but a telephone line connection as at Cape Blanco, Ore., where accounting is done with the Coos Bay Home Telephone Company. At Tatoosh the connecting telegraph line is controlled by the Weather Bureau which involves accounting with that bureau. Several naval coast stations that are open to commercial business are on outlying possessions, as at Guantanamo Bay, San Juan, Colon, Darien, Balboa, Guam and stations in Alaska. These are connected to land lines in the countries in which they are situated, some of them foreign as in the cases of Guantanamo through Cuba, the Canal Zone stations through the Republic of Panama, and all are connected with other points by cables which through their connections may reach all parts of the world. As an illustration of the work falling on the administration of the Naval Radio Service due to its commer-

cial business, it is but necessary to name the different companies with which the Office of the Superintendent must do accounting. Companies which own or control lines or cables which connect with naval coast stations open to commercial business are:

Bahama Cable Company,
Commercial Pacific Cable Company,
Compagnie Francaise des Cables Telegraphiques,
Coos Bay Home Telephone Co.,
Cuban Telegraph Co.,
Direct West India Cable Co.,
Insular Telegraph Co.,
Panama Rail Road Telegraph Co.,
Postal Telegraph Cable Co.,
West India and Panama Telegraph Co.,
Western Union Telegraph Co.

Companies which own or operate radio installations on board ship and with which accounting is necessary are:

Atlantic Communication Co.,
"Debeg Company,"
Dollar Steamship Co.,
Deutsch Amerikanische Petroleum Co.,
Furness Withy & Co., Ltd.,
Funch Edye & Co.,
Hamburg American Line,
Herrera S. S. Co.,
Marconi Wireless Telegraph Co. of America,
United Fruit Co., or
Tropical Radio Telegraph Co.

Of the above the Marconi Wireless Telegraph Company of America accounts, either direct or through their affiliated companies, for about 1800 vessels, the Debeg 250 vessels and the United Fruit Company or Tropical Radio Telegraph Company 22 vessels. In addition to the above there are many individual ships and yachts on which the radio installation is owned by the owners of the vessels and not by radio operating companies, in which case accounting is done direct with such owners or agents.

Accounting is necessary with eight or ten fish canning and packing companies which operate small shore stations in Alaska for their own business convenience. These stations, though on shore, are considered as ship stations for all purposes of accounting.

Accounting is necessary with many departments of the government, as the Revenue Cutter Service of the Treasury Department, the Army Transport Service of the War Department, and the Army Signal Corps Service, through connections in Alaska over the military cable.

INTERNATIONAL ACCOUNTING

The Office of the Superintendent of Naval Radio Service is charged with the settlement of all international accounts. This involves accounting with foreign governments which may control coastal stations through which pass messages from our own national vessels, but includes the accounting on all messages which pass through any of our coast stations, either privately or government owned, from foreign national vessels. Private operating companies controlling shore stations in the United States which transmit messages originating on foreign national vessels forward their accounts to the Naval Radio Service for collection and this office deals directly with corresponding offices of the governments concerned. Similarly when any of our national vessels have occasion to use foreign coastal stations in the transmission of radiograms, the administration controlling the shore stations sends their accounts to the superintendent's office for collection. In all cases the shore station accounts include their own and all forwarding charges, and on receipt of charges, they retain their own tolls and turn over the balance to the first forwarding company.

DISPOSITION OF TOLLS COLLECTED

All tolls collected on account of radiograms handled by naval coast or ship stations are, in accordance with the Radio Act of August, 1912, turned into the Treasury as miscellaneous receipts.

BOOK NOTICE

"A Reader of Scientific and Technical Spanish." By Lieut. Colonel C. DeW. Wilcox, U. S. A. Published by Sturgis and Walton Company, New York, 588 pages. Price $1.75 net.

This is an invaluable work for anyone taking up engineering, salesmanship of technical character, or other similar business in Spanish-speaking countries.

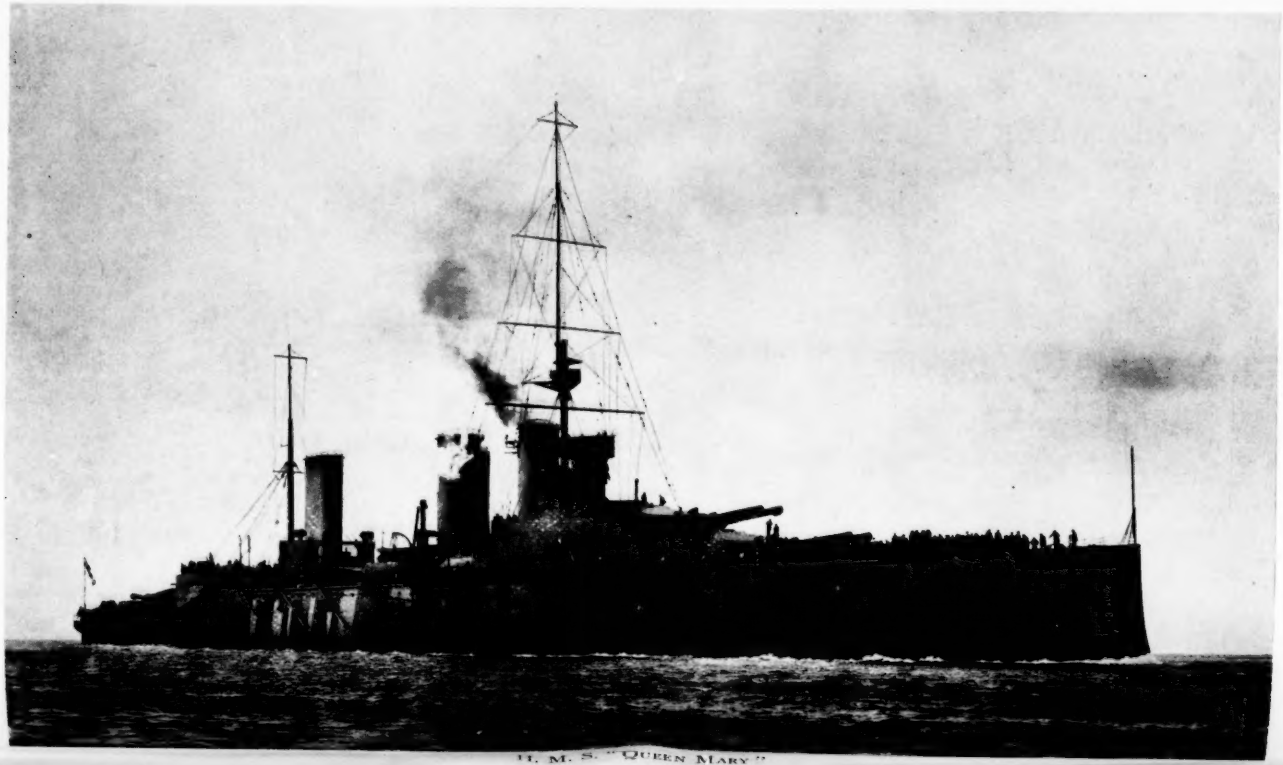
It contains the principal vocabulary of most of the scientific and technical vocations. Not only are the words themselves given, but their idiomatic employment in text and conversation are very clearly indicated.

It is worth while enumerating the different chapters: Physics, Chemistry, Care of Modern Powders, Electricity, Hydraulics, Steam, Compressed Air, Turbines, Power Transmission, Minerals, Bridges, Railways, Surveying, Topography, Geography, Automobiles, Aeronautics, Submarines, Campaign of Santiago de Cuba.

These technicalities are also divided into sub-heads, conveniently illustrated. The subject matter is taken from various standard Spanish works, each extract being from a first-class book or magazine.

As the author states, some things have been necessarily omitted—such as ordnance, armor, forging, foundry and shop work, high explosives and demolitions, etc.—but compromise is bound to be the keynote of a work of this character.

A. B. HOFF.



H. M. S. "Queen Mary"

PROFESSIONAL NOTES

Prepared by LIEUTENANT C. C. GILL, U. S. Navy

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A CORRECTION AND AN ACKNOWLEDGMENT

It is regretted that through inadvertence credit was not expressly given to the Office of Naval Intelligence for compiling the tables comparing the strength of the principal naval powers published in the Professional Notes of the last issue.

This opportunity is taken to gratefully acknowledge the courteous assistance given by the officers on duty in the Intelligence Office in correcting the tables of "vessels building," which appear in this issue.

FOREIGN SHIPBUILDING PROGRAM

OFFICE OF NAVAL INTELLIGENCE, January 31, 1914.

The naval estimates of the principal powers show a steady increase as compared with those of the preceding year.

The only battleships now under construction are of the all-big-gun type, and of increased tonnage.

The only battle cruiser authorized during the year was the German cruiser *Ersatz Hertha*.

The 12-inch gun for battleships has now been universally discarded in favor of a 13.4-inch or larger gun, England, Germany, and Italy having adopted a 15-inch weapon. France adheres to the 13.4-inch gun, but has increased the number in each turret to four.

Submarines are receiving marked attention, and their size and speed have been greatly increased.

Mining ships and submarine salvage ships are now found in all the principal navies.

Italy and Austria-Hungary are the only naval powers that continue to build small torpedo craft.

The following are the shipbuilding programs of the various naval powers:

GREAT BRITAIN

[Financial year, April 1 to March 31]

The total naval estimates for 1913-14 amount to $235,213,498 as compared with $228,430,065 for the year 1912-13 (including the supplementary estimates). The principal increases occur under the heads of "Pay of personnel," "Victualing and clothing," and "Naval armaments." The increase in personnel is due to the requirements of new ships being placed in commission and under construction. The total number of officers and men will reach 146,000. The total cost of new construction is $77,662,162.

The actual standard of new construction which the Admiralty has, in fact, followed during recent years has been to develop a 60 per cent superiority in vessels of the dreadnought type over the German Navy on the basis of an existing fleet law.

The naval aid bill, which provided for a grant of £7,000,000 to the Crown for the construction of three first-class ships, was rejected by the Canadian Senate. In order to maintain the margin of naval strength necessary for the whole world protection of the British Empire for the autumn and winter of 1915 and spring of 1916, it was determined to advance the construction of the three contract ships of the 1913 program. The contracts for these ships were awarded during August; the keels of two were laid before the end of the year, while the remaining ships, together with the two to be built in government dockyards, are to be begun during January, 1914.

The shipbuilding program authorized for 1913-14 provides for the following new construction: 5 battleships, 8 light cruisers, 16 destroyers, a group of submarines, and 2 river gunboats.

During the year there were completed the battleships *Centurion*, *Ajax*, and *Audacious*, each of 23,000 tons displacement. The *Iron Duke*, of 25,000 tons, is completing her trials and will be commissioned shortly. The battle-cruiser *Australia*, of 18,800 tons, and the *Queen Mary*, of 27,000 tons displacement, have joined the fleet.

The 13.5-inch gun has been discarded in favor of a 15-inch weapon, which is to be mounted on the ships of the 1912 program.

Little is known regarding the battleships of the 1913 program, except that they are to be slightly smaller than their predecessors and that they are to burn coal instead of oil.

Contracts for the eight light cruisers were awarded August 15, 1913. These ships are to be generally similar to those of the preceding year.

Contracts for 13 of the 16 destroyers authorized have been awarded.

Of the submarines authorized neither the number nor the size has been officially announced.

GERMANY

[Financial year, April to March]

The total revised estimates for 1913-14 amount to $112,037,576. The ordinary recurring expenditure is $46,980,330; the nonrecurring ordinary expenditure is $53,240,546; the extraordinary expenditure is $11,816,700. This is an increase over last year's (1912-13) final estimates (the ordinary estimates and the supplemental estimates being taken together) of $1,322,532.

Increase of personnel is provided as follows: Two hundred and twenty-three additional officers; 6125 enlisted men. The total authorized strength of the personnel of the navy for 1913 was 3394 officers and 69,495 men.

The existing fleet law as amended provides for by 1920 a fleet to comprise 41 battleships, 20 large cruisers, and 40 small cruisers. In accordance with the memorandum to the estimates of 1906 there are to be altogether 144 torpedo-boats. It is proposed to demand 6 submarines every year. With a 12 years' life this gives an establishment of 72 boats. The law further provides for the maintenance in full commission of about four-fifths of the fleet.

The naval appropriation bill for 1913-14 authorized the following new construction: Two battleships, one battle-cruiser, two small cruisers, one gunboat, one Imperial yacht, one fleet tender, one destroyer flotilla (12), and $4,760,000 for submarine construction and experiments.

During the year there were completed the battleships *Kaiserin*, *König Albert*, and *Prinzregent Luitpold*, each of 24,306 tons displacement, mounting ten 12-inch guns, and the battle-cruiser *Seydlitz*, of 24,385 tons displacement. The two small cruisers *Karlsruhe* and *Rostock*, of 4826 tons displacement, are undergoing their trials and will be commissioned early in 1914. In addition, 12 destroyers and 6 submarines joined the fleet.

The battleships authorized for 1913, the *Ers. Wörth* and the *T*, are to be armed with eight 15-inch guns, the first ships of the German Navy to carry guns larger than 12 inches in caliber.

FRANCE

[Financial year, January to December]

The total naval appropriation in the budget as voted for 1913 amounts to $90,164,989, an increase of $8,472,157 over the appropriation for 1912.

The shipbuilding program authorized for 1913 provides for the following new construction: Four battleships, three destroyers, six submarines, one river gunboat, one dispatch boat. According to the law of 1912, only two battleships were to be laid down during 1913, and two during 1914. Authority was asked and obtained to accelerate the construction of the two 1914 battleships. These vessels are to be armed with twelve 13.4-inch guns mounted in three 4-gun turrets.

During the year there were completed the battleships *Jean Bart* and *Courbet* each of 23,092 tons displacement, six destroyers, and one submarine.

JAPAN

[Financial year, April to March]

The total naval estimates for the fiscal year 1913-14 amount to $48,105,152, which is an increase over the revised estimates of the preceding year of $1,594,811.

The amount allotted for new construction from the continuing expenditure "Expenses for maintaining naval preparation" is $26,278,631. This includes $2,988,000 additional, which is probably the first installment of a new building program to amount to about 90,000,000 yen ($44,820,000), with which three additional battleships of the *Fuso* type are to be constructed.

Three battleships were authorized, one of which was laid down during November, 1913.

The only ship completed during the year was the battle-cruiser *Kongo*, 27,500 tons displacement, armed with eight 14-inch guns.

RUSSIA

[Financial year, January to December]

The naval estimates for 1913 amount to $118,643,820. This is an increase over the revised estimates of 1912 of $36,624,187. This increase is in accordance with the shipbuilding program of June 23, 1912, known as the small shipbuilding program, which provides for 4 battle-cruisers, 8 cruisers, 36 destroyers, and 12 submarines, and the previous arrangements for ships to be built for the Black Sea and the Baltic. The principal items of this increase are as follows: New construction of ships, $16,878,390; armaments, $8,810,722; naval ports, $8,104,558.

During the year the contracts for the ships authorized in 1912 were awarded, and many have already been laid down.

There were no additions to the fleet, but the three battleships under construction for the Black Sea fleet were launched during November, 1913, and work is progressing rapidly.

ITALY

[Financial year, July to June]

The naval estimates for 1913-14 amount to $49,550,147, an increase of $7,656,727 over the estimates for the preceding year. Of the above amount $5,808,260 is for the commercial marine. The balance, $43,203,351, is for the war navy, inclusive of $2,061,723 for pensions, to which must be added, in accordance with the shipbuilding program, an extraordinary credit of $5,790,000 plus $1,640,500 for the "Accounting service," making a total expenditure for the navy of $50,633,851.

The enlisted strength is increased by 4000 men, namely, from 31,000 to 35,000.

The navy appropriation law does not specify the number or type of ships to be laid down, this being left to the discretion of the navy department, but the construction of three battleships was decided upon.

During the year there were completed the cruisers *Nino Bixio* and *Marsala*, of 3470 tons displacement. The battleship *Guilio Cesare* is nearly completed and was undergoing her trials at the end of the year.

AUSTRIA-HUNGARY

[Financial year, January to December]

The naval estimates for 1913 amount to $28,959,414. Of this amount $13,885,200 constitutes the extraordinary credit for new construction allotted for the year 1913 and $14,134,445 the ordinary expenditure. Under these two heads the total amount available for new construction is $15,983,292, of which $191,632 is for armaments. The personnel is hereby increased as follows: 1 rear admiral, 3 captains, 5 commanders, 31 lieutenants, 12 midshipmen, 5 medical officers, 27 engineers, 6 paymasters, and 1500 petty officers and men. The strength will be increased from 14,000 to 21,000 men in 1916.

The only new construction authorized for 1913 were nine torpedo-boats of 250 tons displacement and two colliers.

During the year the battleship *Tegetthoff*, of 20,010 tons displacement, was completed, as well as the scout cruiser *Saida*, of 3484 tons, and three destroyers.

PROGRAMS FOR 1914-15

The programs for 1914-15, so far as they have been determined or published, are as follows:

GREAT BRITAIN

The program for 1914-15 has not yet been published, but the government has been committed by a statement of the First Lord of the Admiralty

to the laying down during the year of at least four first-class armored ships. Provision for the construction of scout cruisers, destroyers, and submarines will undoubtedly also be made.

GERMANY

The total naval estimates for 1914-15, which were promulgated the end of November, 1913, amount to $113,993,329. The ordinary recurring expenditure is $52,612,903; the nonrecurring ordinary expenditure is $54,380,846; the extraordinary expenditure is $6,999,580; this is an increase over last year's final estimates of $1,955,753.

Increase of personnel is provided as follows: 218 officers and 5975 enlisted men. The total authorized strength of the navy for 1914 will be 3612 officers and 75468 men.

The estimates authorize the following new construction: One battleship, one battle-cruiser, two small cruisers, one destroyer flotilla, and $4,522,000 for submarine construction and experiments.

FRANCE

According to press reports the naval estimates for the year 1914 amount to $94,401,088, an increase of $5,372,462 over the naval estimates for 1913. For the acceleration of the shipbuilding program (under a loan voted), the sum of $28,092,665 is added to the above amount, making a total expenditure for the navy of $122,493,753. The total expenditure provided for the execution of the naval program amounts to $63,655,515. Provision is also made for an increase of 4350 men in personnel.

It is proposed to lay down the following ships: One battleship, 3 scout cruisers, 1 destroyer, 5 submarines, 1 oiler, and 1 mine layer.

JAPAN

The naval estimates for 1914-15 amount to $50,148,600. The budget has not yet been passed by the Japanese Parliament.

From press reports the budget contains a new naval program entailing an expenditure of $77,864,000 spread over seven years. The first installment of $4,980,000 authorizes the construction of 1 battleship, 16 destroyers, and 10 submarines.

RUSSIA

From press reports the naval estimates presented to the Duma on October 6, 1913, amounted to $130,597,902, which is an increase over the preceding year of $11,954,082. Of this amount $57,358,038 is for new construction.

On November 3, 1913, the minister of marine presented to the Duma a bill providing for a supplementary credit of $40,337,000 (for new construction and extention of naval ports) in addition to the ordinary naval budget.

AUSTRIA-HUNGARY

According to press reports, the naval budget adopted in December, 1913, covers only the period from January 1 to June 30, 1914, as it is intended to begin the fiscal year in the future with July 1 instead of January 1.

It is reported that the naval expenditures for the first half of 1914 were as follows: $7,688,337 for the half-yearly naval estimates (ordinary and extraordinary), $9,642,500 for the extraordinary shipbuilding credit, $1,564,623 extraordinary credits for special requirements of the navy and new harbor works at Pola, and $8,210,103 extraordinary credit to cover expenses of mobilization of the fleet during the last Balkan crisis, making a total expenditure of $27,105,563. From the above amounts $11,172,917 is appropriated for new construction, including armaments, mines, and ammunition.

Vessels under construction in the several countries during 1913

ENGLAND

Name	Type	Displacement	Authorized	Keel laid	Remarks.
Centurion	B.....	23,000	1910	Jan. 16, 1911	Completed May 22, 1913.
Ajax	B.....	23,000	1910	Feb. 27, 1911	Completed Oct. 8, 1913.
Audacious	B.....	23,000	1910	Mar. 23, 1911	Completed Oct. 21, 1913.
Iron Duke	B.....	25,000	1911	Jan. 15, 1912	Trials during Nov., 1913.
Marlborough	B.....	25,000	1911	Jan. 25, 1912	
Benbow	B.....	25,000	1911	May 30, 1912	
Emperor of India	B.....	25,000	1911	May 31, 1912	
Queen Elizabeth	B.....	27,500	1912	Oct. 21, 1912	
Barham	B.....	27,500	1912	Feb. 24, 1913	
Valiant	B.....	27,500	1912	Jan. 31, 1913	
Warspite	B.....	27,500	1912	Oct. 31, 1912	
Malaya	B.....	27,500	1913	Nov. 1, 1913	Gift of Federated Malay States.
Ramillies	B.....	26,000	1913	Nov. 12, 1913	
Resolution	B.....	26,000	1913	Nov. 28, 1913	
Australia	B.C...	18,800	1909	June 23, 1910	Completed June 16, 1913, colonial.
Queen Mary	B.C...	27,000	1910	Mar. 6, 1911	Completed Sept. 4, 1913.
Tiger	B.C...	28,500	1911	June 20, 1912	
Amphion	C.....	3,440	1910	Mar. 15, 1911	Completed Apr. 2, 1913.
Dublin	C.....	5,400	1910	April 4, 1911	Completed Mar. 11, 1913.
Sydney	C.....	5,400	1910	Feb. 11, 1911	Completed June 20, 1913, colonial.
Melbourne	C.....	5,400	1910	April 14, 1911	Completed Jan., 1913, colonial.
Brisbane	C.....	5,400	1910	Jan. 25, 1913	Colonial.
Fearless	C.....	3,360	1911	Nov. 15, 1911	Completed Oct. 14, 1913.
Nottingham	C.....	5,440	1911	June 12, 1912	
Birmingham	C.....	5,440	1911	June 10, 1912	
Lowestoft	C.....	5,440	1911	July 29, 1912	Trial during Dec., 1913.
Arethusa	C.....	3,700	1912	Oct. 29, 1912	
Aurora	C.....	3,700	1912	Oct. 24, 1912	
Galatea	C.....	3,700	1912	Jan. 9, 1913	
Inconstant	C.....	3,700	1912	—— —, 1913	
Royalist	C.....	3,700	1912	Mar. 12, 1913	
Penelope	C.....	3,700	1912	Feb. 1, 1913	
Phaeton	C.....	3,700	1912	—— —, 1913	
Undaunted	C.....	3,700	1912	Dec. 21, 1912	
Cordelia	C.....	4,400	1913	July 21, 1913	
Achates	Des...	935	1911	Jan. 15, 1912	Completed Apr. 14, 1913.
Ambuscade	Des...	935	1911	Mar. 7, 1912	Completed July, 1913.
Ardent	Des...	931	1911	Oct. 9, 1912	
Cockatrice	Des...	938	1911	Oct. 23, 1911	Completed Mar. 18, 1913.
Contest	Des...	938	1911	Dec. 26, 1911	Completed June 17, 1913.
Fortune	Des...	952	1911	June 24, 1912	Completed Dec. 31, 1913.
Garland	Des...	964	1911	July 15, 1912	Completed Dec. 18, 1913.
Hardy	Des...	908	1911	Nov. 13, 1911	Completed Dec. 4, 1913.
Lynx	Des...	935	1911	Jan. 18, 1912	Completed 1913.
Midge	Des...	935	1911	April 1, 1912	Trials Dec., 1913.
Paragon	Des...	928	1911	Mar. 14, 1912	Completed Dec. 12, 1913.
Shark	Des...	935	1911	Oct. 27, 1911	Completed Apr. 9, 1913.
Sparrowhawk	Des...	935	1911	Oct. 17, 1911	Completed May 6, 1913.
Spitfire	Des...	935	1911	Dec. 18, 1911	Completed June 25, 1913.
Owl	Des...	935	1911	April 1, 1912	
Porpoise	Des...	928	1911	Mar. 14, 1912	
Unity	Des...	928	1911	April 1, 1912	
Victor	Des...	928	1911	....do	
Laertes	Des...	945	1912	July 6, 1912	Completed Oct. 28, 1913.
Lark	Des...	945	1912	June 28, 1912	Completed Nov. 27, 1913.
Linnet	Des...	945	1912	....do	Completed Dec., 1913.
Lysander	Des...	945	1912	Aug. 8, 1912	Completed Dec. 10, 1913.
Laforey	Des...	945	1912	Sept. 9, 1912	
Lance	Des...	945	1912	Aug. 1, 1912	
Landrail	Des...	945	1912	July 24, 1912	
Laurel	Des...	945	1912	Aug. 17, 1912	Trials during Oct., 1913.
Laverock	Des...	945	1912	Nov. 19, 1913	
Lawford	Des...	935	1912	Sept. 28, 1912	
Legion	Des...	945	1912	Sept. 17, 1912	

Vessels under construction in the several countries during 1913—Continued

ENGLAND—Continued

Name	Type	Displacement	Authorized	Keel laid	Remarks
Lennox	Des...	945	1912	Nov. 18, 1912	
Leonidas	Des...	945	1912	Oct. 26, 1912	
Liberty	Des...	935	1912	Aug. 31, 1912	
Llewellyn	Des...	935	1912	Nov. 14, 1912	
Lookout	Des...	945	1912	Aug. 29, 1912	
Louis	Des...	945	1912	Dec. 5, 1912	
Loyal	Des...	945	1912	Sept. 16, 1912	
Lucifer	Des. .	945	1912	Oct. 26, 1912	
Lydiard	Des...	945	1912	Dec. 14, 1912	
Derwent	Des...	800	1912	Jan. 25, 1913	Colonial.
Swan	Des...	800	1912	—— —, 1913	Do.
Torrence	Des...	800	1912	Jan. 25, 1913	Do.
Manly	Des...	945	1913	—— —, 1913	
Mansfield	Des...	1,000	1913	—— —, 1913	
Mastiff	Des...	1,000	1913	—— —, 1913	
Matchless	Des. .	1,000	1913	—— —, 1913	
Menace	Des...	1,000	1913	—— —, 1913	
Mentor	Des...	1,000	1913	—— —, 1913	
Meteor	Des...	1,000	1913	—— —, 1913	
Milne	Des...	1,000	1913	—— —, 1913	
Minos	Des...	1,000	1913	—— —, 1913	
Miranda	Des...	1,000	1913	—— —, 1913	
Moorsom	Des...	1,000	1913	—— —, 1913	
Morris	Des...	1,000	1913	—— —, 1913	
Murray	Des...	1,000	1913	—— —, 1913	
Myngs	Des...	1,000	1913	—— —, 1913	
E-1 to E-6	Sub...	810	1911	—— —, 1912	Completed 1913.
E-7 to E-14	Sub...	810	1911	Feb. —, 1912	
A. E-1 and A. E-2	Sub...	810	1910	Feb. —, 1912	Colonial, completed 1913.
F-1 to F-6	Sub...	1,200	1912	—— —, 1913	
X	Sub...	340	1911	—— —, 1912	Laurenti type.
6 boats	Sub...	1,200	1913	.....	
2 boats	Sub...	.....	1913	.....	Laubeuf type.

The contracts for the 5 battleships authorized in 1913 were awarded on Aug. 15, 1913, 2 to Government yards and 3 to private firms. The 2 ships to be built in Government yards and the 1 by Messrs. Vickers (Ltd.) will be laid down during January, 1914. Of the 8 light cruisers authorized, 5 are to be built in Government yards. Contracts for 13 of the 16 destroyers were awarded on Aug. 15, 1913. Many of these destroyers were under construction as stock boats, and were taken over by the Government.

GERMANY

Kaiserin	B.....	24,306	1910	Oct. —, 1910	Completed May 15, 1913.
König Albert	B.....	24,306	1910	July —, 1910	Completed July 31, 1913.
Prinzregent Luitpold	B.....	34,300	1910	Jan. —, 1911	Completed Aug. 19, 1913.
Grosser Kurfürst	B.....	26,575	1911	July —, 1911	
Markgraf	B.....	26,575	1911	Apr. —, 1911	
König	B.....	26,575	1911	Apr. —, 1911	
Ers. Brandenburg	B.....	26,575	1912	July 1, 1912	
"T"	B.....	28,000	1913	June —, 1913	
Ers. Wörth	B.....	28,000	1913	June —, 1913	
Seydlitz	B.C...	24,385	1910	Feb. 4, 1911	Completed Oct. 1, 1913.
Derfflinger	B.C...	27,000	1911	Nov. —, 1911	
Lützow	B.C...	28,000	1912	Sept. 5, 1912	
Ers. Hertha	B.C...	29,000	1913	Aug. —, 1913	
Karlsruhe	C	4,826	1911	Oct. —, 1911	Trials during Dec., 1913.
Rostock	C.....	4,826	1911	Oct. —, 1911	Trials during Dec., 1913.
Graudenz	C.....	5,443	1912	Oct. 23, 1912	
Ers. Irine	C.....	5,443	1912	Oct. 24, 1912	
Ers. Hela	C.....	5,500	1913	Fall, 1913	
Ers. Gefion	C.....	5,500	1913	....do.....	
S-13 to S-24	Des. .	553	1912	Feb. —, 1912	Completed by Oct., 1913.
V-25 to V-30	Des...	640	1913	—— —, 1913	
S-31 to S-36	Des...	640	1913	—— —, 1913	
U-19 to U-24	Sub...	800	1911	Apr. —, 1911	Completed during 1913.
U-25 to U-30	Sub...	800	1912	—— —, 1912	
U-31 to U-36	Sub...	1,000	1913	—— —, 1913	

Tonnage for ships still under construction taken from press reports.

Vessels under construction in the several countries during 1913—Continued

FRANCE

Name	Type	Displacement	Authorized	Keel laid	Remarks
Jean Bart	B.....	23,992	1910	Nov. 10, 1910	Completed June 5, 1913.
Courbet	B.....	23,092	1910	Sept. 1, 1910	Completed Aug., 1913.
France	B.....	23,092	1911	Nov. 10, 1911	
Paris	B.....	23,092	1911	Dec. 1, 1911	
Bretagne	B.....	23,172	1912	July 22, 1912	
Provence	B.....	23,172	1912	July 12, 1912	
Lorraine	B.....	23,172	1912	Oct. 24, 1912	
Normandie	B.....	24,848	1913	July 5, 1913	
Languedoc	B.....	24,848	1913	Apr. 28, 1913	
Flandre	B.....	24,848	1913	Oct. 10, 1913	
Gascogne	B.....	24,848	1913	Oct. 1, 1913	
Dehorter	Des...	753	1908	*Feb. 16, 1910	Completed May 1, 1913.
Francis Garnier	Des...	732	1908	*Jan. 19, 1910	Completed Apr. 30, 1913.
Commandant Bory	Des...	742	1908	*Jan. 12, 1910	Completed 1913.
Commandant Rivière	Des...	753	1908	*Feb. 16, 1910	Completed June 15, 1913.
Magon	Des...	827	1910	*July 21, 1910	Trials Sept., 1913.
Mangini	Des...	787	1910	.....do.....	
Commandant Lucas	Des...	756	1910	.....do.....	
Bisson	Des...	756	1910	.....do.....	Completed Sept. 8, 1913.
Renaudin	Des...	756	1910	.....do.....	Completed Oct. 22, 1913.
Protet	Des...	756	1910	.....do.....	
Enseigne Roux	Des...	837	1913	—— —, 1913	
Mécanicien Principal Lestin	Des...	837	1913	—— —, 1913	
Enseigne Gabolde	Des...	906	1913	*Nov. —, 1913	
Franklin	Sub...	540	1906	Oct. —, 1910	
Gustave Zédé	Sub...	984	1910	Sept. —, 1911	Completed Oct., 1913.
Clorinde	Sub...	550	1910	Oct. 30, 1911	
Cornélie	Sub...	550	1910	Oct. —, 1911	
Néréide	Sub...	984	1911	Sept. —, 1911	
Amarante	Sub...	550	1912	—— —, 1912	
Amphitrite	Sub...	550	1912	—— —, 1912	
Andromaque	Sub...	550	1912	Mar. —, 1912	
Aréthuse	Sub...	550	1912	—— —, 1912	
Ariane	Sub...	550	1912	Jan. —, 1912	
Arthémis	Sub...	550	1912	—— —, 1912	
Astrée	Sub...	550	1912	—— —, 1912	
Atlante	Sub...	550	1912	—— —, 1912	
Bellone	Sub...	700	1912	Aug. 1, 1912	
Daphné	Sub...	750	1913	—— —, 1913	
Diane	Sub...	750	1913	—— —, 1913	
Dupuy de Lôme	Sub...	1,053	1913	Sept. 1, 1913	
Gorgone	Sub...	700	1913	—— —, 1913	
Hermione	Sub...	700	1913	—— —, 1913	
Sané	Sub...	1,053	1913	Nov. 1, 1913	

JAPAN

Fuso	B.....	30,000	1911	Mar. 11, 1912	
No. 2	B.....	30,000	1913	*—— —, 1913	
No. 3	B.....	30,000	1913	*—— —, 1913	
No. 4	B.....	30,000	1913	Nov. 20, 1913	
Kongo	B.C...	27,500	1911	Jan. 17, 1911	Completed Aug., 1913.
Hiyei	B.C...	27,500	1911	Nov. 4, 1911	
Kirishima	B.C...	27,500	1911	Mar. 17, 1912	
Haruna	B.C...	27,500	1911	Mar. 16, 1912	
2 boats	Des...	600	1912	—— —, 1912	
Do	Sub...	660	1912	—— —, 1912	

RUSSIA

Sevastopol	B.....	23,026	1908	June 16, 1909	
Poltava	B.....	23,026	1908	.....do.....	
Petropavlovsk	B.....	23,026	1908	.....do.....	
Gangut	B.....	23,026	1908	.....do.....	
Imperator Aleksandr III	B.....	22,435	1911	Oct. 30, 1911	
Ekaterina II	B.....	22,435	1911	Sept. 1, 1912	

* Signifies date of contract or of order to dockyard; when there is no (*) the date is that of laying of keel.

Vessels under construction in the several countries during 1913—Continued

RUSSIA—Continued

Name	Type	Displacement	Authorized	Keel laid	Remarks
Imperatritsa Maria	B	22,435	1911	Oct. 30, 1911	
Navarin	B.C.	32,000	1911	Dec. 19, 1912	
Borodino	B.C.	32,000	1911	do	
Ismail	B.C.	32,000	1911	do	
Kinburn	B.C.	32,000	1911	do	
Admiral Boulakof	C.	6,500	1912	Dec. —, 1913	
Admiral Spiridov	C.	6,500	1912	Dec. —, 1913	
Admiral Grieg	C.	6,500	1912	Dec. 7, 1913	
Svietlana	C.	6,500	1912	do	
Admiral Lazarev	C.	6,500	1912	Oct. 19, 1913	
Admiral Nakhimov	C.	6,500	1912	do	
Admiral Nevelskoi	C.	4,500	1912	Mar. —, 1913	
Mouraviev Amoursky	C.	4,500	1912	Mar. —, 1913	
Bespokoyni	Des.	1,083	1911	*Aug. 17, 1911	
Grievni	Des.	1,083	1911	do	
Gromki	Des.	1,083	1911	July 1, 1912	
Pespeschni	Des.	1,083	1911	do	
Pilki	Des.	1,083	1911	Oct. 16, 1913	
Pronzitelni	Des.	1,083	1911	Oct. 18, 1913	
Stchastlivi	Des.	1,083	1911	Oct. 16, 1913	
Bistri	Des.	1,083	1911	do	
Derzki	Des.	1,083	1911	Oct. 18, 1913	
Leitnant Iline	Des.	1,260	1912	—— —, 1913	
Kapitan Kononzotov	Des.	1,260	1912	—— —, 1913	
Kapitan Kinsbergen	Des.	1,260	1912	—— —, 1913	
Kapitan Krown	Des.	1,260	1912	—— —, 1913	
Kapitan Belli	Des.	1,260	1912	*—— —, 1913	
Kapitan Tsylmeiev	Des.	1,260	1912	*—— —, 1913	
Kapitan Kern	Des.	1,260	1912	*—— —, 1913	
Leitnant Doubassov	Des.	1,260	1912	*—— —, 1913	
Orphee	Des.	1,260	1912	—— —, 1913	
Grom	Des.	1,260	1912	—— —, 1913	
Zabiaka	Des.	1,260	1912	—— —, 1913	
Pobeditel	Des.	1,260	1912	—— —, 1913	
Letoun	Des.	1,260	1912	*—— —, 1913	
Desna	Des.	1,260	1912	*—— —, 1913	
Samson	Des.	1,260	1912	*—— —, 1913	
Ikard	Des.	1,260	1912	*—— —, 1913	
Garriil	Des.	1,260	1912	Dec. 7, 1913	
Mikhail	Des.	1,260	1912	do	
Wladimir	Des.	1,260	1912	do	
Constantin	Des.	1,260	1912	do	
Sokol	Des.	1,260	1912	Dec. —, 1913	
Leitnant Lombard	Des.	1,260	1912	do	
Gogland	Des.	1,260	1912	*—— —, 1913	
Frengamn	Des.	1,260	1912	*—— —, 1913	
Stirzouden	Des.	1,260	1912	*—— —, 1913	
Patras	Des.	1,260	1912	*—— —, 1913	
Chios	Des.	1,260	1912	*—— —, 1913	
Tenedos	Des.	1,260	1912	*—— —, 1913	
Rimnik	Des.	1,260	1912	*—— —, 1913	
Smolensk	Des.	1,260	1912	*—— —, 1913	
Koulm	Des.	1,260	1912	*—— —, 1913	
Gromonocets	Des.	1,260	1912	Oct. —, 1913	
Avtroil	Des.	1,260	1912	do	
Briatcheslav	Des.	1,260	1912	do	
Fedor-Stratilat	Des.	1,260	1912	do	
Priamislav	Des.	1,260	1912	*—— —, 1913	
Cachalot	Sub.	500	1911	Oct. —, 1913	
Kit	Sub.	500	1911	do	
Narval	Sub.	500	1911	do	
Nerpa	Sub.	750	1911	*Aug. 17, 1911	
Morj	Sub.	750	1911	*do	
Tiulen	Sub.	750	1911	*do	
Bars	Sub.	750	1912	Sept. 27, 1913	
Gepard	Sub.	750	1912	do	
Depr	Sub.	750	1912	do	
Volk	Sub.	750	1912	do	
Lvitsa	Sub.	750	1912	—— —, 1913	
Pantera	Sub.	750	1912	—— —, 1913	
Kougoir	Sub.	750	1912	—— —, 1913	
Leopard	Sub.	750	1912	*—— —, 1913	
Tour	Sub.	750	1912	*—— —, 1913	
Riss	Sub.	750	1912	*—— —, 1913	
Tigr	Sub.	750	1912	*—— —, 1913	
Jagouar	Sub.	750	1912	*—— —, 1913	

* Signifies date of contract.

Vessels under construction in the several countries during 1913—Continued

ITALY

Name	Type	Displacement	Authorized	Keel laid	Remarks
Conte-di-Cavour	B.	22,340	1909	Aug. 10, 1910	
Guilio Cesare	B.	22,340	1909	July 23, 1910	Trials during Nov., 1913.
Leonardo da Vinci	B.	22,340	1909	Apr. 18, 1910	
Duilio	B.	22,040	1911	Apr. 24, 1912	
Andrea Doria	B.	22,040	1911	Mar. 24, 1912	
3 ships	B.	28,000	1913	*Sept. —, 1913	
Nino Bixio	C.	3,470	1910	Feb. 15, 1911	Completed 1913
Marsala	C.	3,470	1910	.....do.....	Completed Aug., 1913.
Campania	C.	2,483	1913	Aug. 9, 1913	
Basilicate	C.	2,483	1913	.....do.....	
Libia	C.	3,800	.....	—— —, 1912	Laid down for Turkey, but seized during war.
Ardito	Des.	640	1909	—— —, 1910	Completed 1913.
Ascaro	Des.	340	1909	—— —, 1910	Do.
Irrequieto	Des.	613	1909	—— —, 1910	Do.
Intrepido	Des.	613	1909	—— —, 1910	Do.
Impavido	Des.	613	1909	—— —, 1910	
Insidioso	Des.	613	1909	—— —, 1910	
Impetuoso	Des.	613	1909	—— —, 1910	
Ardente	Des.	640	1909	—— —, 1910	Trials Nov., 1913.
Audace	Des.	640	1909	—— —, 1910	
Animoso	Des.	640	1909	—— —, 1910	
Francesco Nullo	Des.	680	1912	Aug. —, 1913	
Giuseppe Sirtori	Des.	680	1912	Aug. —, 1913	
Antonio Mosto	Des.	680	1912	Aug. —, 1913	
Giacinto Carini	Des.	680	1912	Aug. —, 1913	
Alessandro Poerio	Des.	1,000	1912	*Aug. —, 1913	
Cesare Rossaroll	Des.	1,000	1912	*Aug. —, 1913	
Guglielmo Pepe	Des.	1,000	1912	*Aug. —, 1913	
Rosolino Pilo	Des.	680	1912	*Aug. —, 1913	
Giuseppe Abba	Des.	680	1912	*Aug. —, 1913	
Ippolito Nievo	Des.	680	1912	*Aug. —, 1913	
Simone Schiaffino	Des.	680	1912	*Aug. —, 1913	
Pilado Bronzetti	Des.	680	1912	*Aug. —, 1913	
Giuseppe Missori	Des.	680	1912	*Aug. —, 1913	
18-OS to 24-OS	T.B.	115	1909	—— —, 1910	Completed 1913.
25-AS to 32-AS	T.B.	115	1909	—— —, 1910	Do.
33-PN to 38-PN	T.B.	115	1912	—— —, 1912	Do.
39-RM and 40-RM	T.B.	115	1912	—— —, 1912	
Zoca	Sub.	300	1909	—— —, 1911	Do.
Jantina	Sub.	300	1909	—— —, 1911	Do.
Nautilus	Sub.	300	1910	—— —, 1911	Completed Sept., 1913.
Nereide	Sub.	300	1910	—— —, 1911	Completed Oct., 1913.
Giacinto Pullino	Sub.	420	1910	Jan. 3, 1912	
Galileo Ferrari	Sub.	420	1910	.....do.....	

AUSTRIA-HUNGARY

Tegetthof	B.	20,010	1911	Nov. 15, 1910	Completed July 13, 1913.
Prinz Eugen	B.	20,010	1911	Jan. 17, 1912	
Szent Istvan	B.	20,010	1911	Jan. 29, 1912	
Saida	C.	3,484	1911	Sept. 7, 1911	Completed Dec., 1913.
Helgoland	C.	3,484	1911	Oct. 28, 1911	
Novara	C.	3,484	1911	Feb. 9, 1912	
Tatra	Des.	787	1911	Oct. 19, 1911	Completed Oct., 1913.
Balaton	Des.	787	1911	Nov. 9, 1911	Completed Dec., 1913.
Csepel	Des.	787	1911	Jan. 9, 1912	Do.
Lika	Des.	787	1911	Feb. —, 1912	
Orjen	Des.	787	1911	Mar. —, 1912	
Triglav	Des.	787	1911	Mar. —, 1912	
74-T to 81-T	T.B.	250	1911	—— —, 1912	
82-F to 97-F	T.B.	250	1912	—— —, 1912	
98-M to 100-M	T.B.	250	1913	—— —, 1913	
U-7 to U-11	Sub.	800	1912	—— —, 1913	
U-12 to U-14	Sub.	700	1913	—— —, 1913	

* Indicates date of contract.

Recent battleships and armored cruisers of over 17,000 tons displacement built, building, or proposed

ENGLAND

Name	Type	Displacement	Authorized	Keel laid	Launched	Date of completion	Remarks
Dreadnaught	B...	17,900	1905	Oct., 1905	Feb., 1906	Oct., 1906	
Invincible	B.C.	17,250	1905	Apr., 1906	Apr., 1907	Mar., 1909	
Inflexible	B.C.	17,250	1905	Feb., 1906	June, 1907	Oct., 1908	
Indomitable	B.C.	17,250	1905	Mar., 1906	Mar., 1907	June, 1908	
Bellerophon	B...	18,600	1906	Dec., 19 6	July, 1907	Dec., 1908	
Temeraire	B...	18,600	1906	Jan., 1907	Aug., 1907	May, 1909	
Superb	B...	18,600	1906	Feb., 1907	Nov., 1907	....do	
St. Vincent	B...	19,250	1907	Dec., 1907	Sept., 1908	May, 1910	
Collingwood	B...	19,250	1907	Feb., 1908	Nov., 1908	Apr., 1910	
Vanguard	B...	19,250	1907	Apr., 1908	Feb , 1909	Mar., 1910	
Neptune	B...	19,900	1908	Jan., 1909	Sept., 1909	Jan., 1911	
Indefatigable	B.C.	18,750	1908	Feb., 1909	Oct., 1909	Feb., 1911	
Hercules	B...	22,500	1909	July, 1909	May, 1910	July, 1911	
Colossus	B...	22,500	1909	....do	Apr., 1910	Aug., 1911	
Orion	B...	22,500	1909	Nov., 1909	Aug., 1910	Jan., 1912	
Lion	B.C.	26,350	1909	....do ...	....do	June, 1912	
Thunderer	B...	22,500	1909	Apr., 1910	Feb., 1911	....do	
Conqueror	B...	22,500	1909	....do	May, 1911	Nov., 1912	
Monarch	B...	22,500	1909	....do	Mar., 1911	Apr., 1912	
Princess Royal	B.C.	26,350	1909	May, 1910	Apr., 1911	Nov., 1912	
Australia	B.C.	18,800	1909	June, 1910	Oct., 1911	June, 1913	Colonial.
New Zealand	B.C.	18,800	1909	....do	July, 1911	Nov., 1912	Do.
Queen Mary	B.C.	27,000	1910	Mar., 1911	Mar., 1912	Sept., 1913	
King George V	B...	23,000	1910	Jan., 1911	Oct., 1911	Nov., 1912	
Centurion	B...	23,000	1910	....do	Nov., 1911	May, 1913	
Audacious	B...	23,000	1910	Mar., 1911	Sept., 1912	Oct., 1913	
Ajax	B...	23,000	1910	Feb., 1911	Mar., 1912	....do	
Iron Duke	B...	25,000	1911	Jan., 1912	Oct., 1912	.....	Trials, Nov., 1913.
Marlborough	B...	25,000	1911	....do	....do	.....	
Benbow	B...	25,000	1911	May, 1912	Nov., 1913	.....	
Emperor of India	B ..	25,0 0	1911	....do	....do	.....	
Queen Elizabeth	B...	27,500	1912	Oct., 1912	Oct., 1913	.....	
Warspite	B...	27,500	1912	....do	Nov., 1913	.....	
Valiant	B...	27,500	1912	Jan., 1913	.....	.....	
Barham	B...	27,500	1912	Feb., 1913	.....	.....	
Tiger	B.C.	28,500	1911	June, 1912	Dec., 1913	.....	
Malaya	B...	27,5 0	1913	Nov., 1913	.....	.....	Gift Federated Malay States.
Ramillies	B...	26,000	1913	....do	.....	.....	
Resolution	B...	26,000	1913	....do	.....	.....	
Royal Sovereign	B...	26,000	1913	.....	.....	.....	
Royal Oak	B...	26,000	1913	.....	.....	.....	
Revenge	B...	26,000	1913	.....	.....	.....	

GERMANY

Nassau	B...	18,602	1906	July, 1907	Mar., 1908	Oct., 1909	
Westfalen	B...	18,602	1906	....do	July, 1908	Nov., 1909	
Posen	B...	18,602	1907	Aug., 1907	Dec., 1908	May, 1910	
Rheinland	B...	18,602	1907	....do	Sept., 1908	Apr., 1910	
Von der Tann	B.C.	19,200	1907	Mar., 1908	Mar., 1909	Sept., 1910	
Ostfriesland	B...	22,440	1908	Oct., 1908	Sept., 1909	Aug., 1911	
Helgoland	B...	22,440	1908	Dec., 1908	....do	..... do	
Thuringen	B...	22,440	1908	Oct., 1908	Nov., 1909	July, 1911	
Moltke	B.C.	22,637	1908	....do	Apr., 1910	Sept., 1911	
Oldenburg	B...	22,440	1909	Apr., 1909	June, 1910	May, 1912	
Goeben	B.C.	23,600	1909	Aug., 1909	Mar., 1911	July, 1912	
Kaiser	B...	24,306	1909	Dec., 1909	....do	Aug., 1912	
Friedrich der Grosse	B ..	24,306	1909	....do	June, 1911	Oct., 1912	
Kaiserin	B...	24,206	1910	Oct., 1910	Nov., 1911	May, 1913	
König Albert	B...	24,206	1910	Jan., 1911	Apr., 1912	July, 1913	
Prinz Regent Luitpold	B...	24,306	1910	....do	Feb., 1912	Aug., 1913	
Seydlitz	B.C.	24,385	1910	Feb., 1911	Mar., 1912	Oct., 1913	

Recent battleships and armored cruisers of over 17,000 tons displacement built, building, or proposed—Continued

GERMANY—Continued

Name	Type	Displacement	Authorized	Keel laid	Launched	Date of completion	Remarks
Grosser Kurfürst	B	26,575	1911	July, 1911	May, 1913		
Markgraf	B	26,575	1911	Nov., 1911	June, 1913		
König	B	26,575	1911	Sept., 1911	Mar., 1913		
Derfflinger	B.C.	27,000	1911	Nov., 1911	July, 1913		
Ersatz Brandenburg	B	26,575	1912	May, 1912			
Lützow	B.C.	28,000	1912	July, 1912	Nov., 1913		
T	B	28,000	1913	May, 1913			
Ersatz Wörth	B	28,000	1913	.....do....			
Ersatz Hertha	B.C.	29,000	1913	June, 1913			
Ersatz Kaiser Friedrich III.	B	(?)	1914				
Ers. Victoria Louise	B.C.	(?)	1914				

FRANCE

Danton	B	18,029	1906	Jan., 1908	July, 1909	June, 1911	
Mirabeau	B	18,029	1906	May, 1908	Oct., 1909	Aug., 1911	
Voltaire	B	18,029	1906	June, 1907	Jan., 1909	.....do....	
Diderot	B	18,029	1906	Oct., 1907	Apr., 1909	Apr., 1911	
Condorcet	B	18,029	1906	Aug., 1907	.....do....	July, 1911	
Verginaud	B	18,029	1906	Nov., 1907	Apr., 1910	Nov., 1911	
Jean Bart	B	23,092	1910	Nov., 1910	Sept., 1911	June, 1913	
Courbet	B	23,092	1910	Sept., 1910	.....do....	Aug., 1913	
France	B	23,092	1911	Nov., 1911	Nov., 1912		
Paris	B	23,092	1911	Dec., 1911	Sept., 1912		
Bretagne	B	23,172	1912	July, 1912	Aug., 1913		
Provence	B	23,172	1912	.....do....	Apr., 1913		
Lorraine	B	23,172	1912	Nov., 1912	Sept., 1913		
Normandie	B	24,848	1913	July, 1913			
Languedoc	B	24,848	1913	Apr., 1913			
Flandre	B	24,848	1913	Oct., 1913			
Gascogne	B	24,848	1913	.....do....			
Bearn	B	24,600	1914				

UNITED STATES

Delaware	B	20,000	1906	Nov., 1907	Feb., 1909	Apr., 1910	
North Dakota	B	20,000	1907	Dec., 1907	Nov., 1908	.....do....	
Florida	B	21,825	1908	Mar., 1908	May, 1910	Sept., 1911	
Utah	B	21,825	1908	Feb., 1909	Dec., 1909	Aug., 1911	
Wyoming	B	26,000	1909	Feb., 1910	May, 1911	Sept., 1912	
Arkansas	B	26,000	1909	Jan., 1910	Jan., 1911	Aug., 1912	
New York	B	27,000	1910	Sept., 1911	Oct., 1912		
Texas	B	27,000	1910	Apr., 1911	May, 1912		Trials, 1913.
Nevada	B	27,500	1911	Nov., 1912			
Oklahoma	B	27,500	1911	Oct., 1912			
Pennsylvania	B	31,400	1912	Oct., 1913			
No. 39	B	31,400	1913				

ARGENTINA

Moreno	B	27,940	1909	July, 1910	Sept., 1911		Trials, 1913.
Rivadavia	B	27,940	1909	May, 1910	Aug., 1911		

Recent battleships and armored cruisers of over 17,000 tons displacement, building, or proposed—Continued

JAPAN

Name	Type	Displacement	Authorized	Keel laid	Launched	Date of completion	Remarks
Satsuma	B...	19,350	1904	May, 1905	Nov., 1906	Apr., 1910	
Aki	B...	19,800	1904	Mar., 1906	Apr., 1907	Apr., 1911	
Settsu	B...	20,800	907	Jan., 1909	Mar., 1911	May, 1912	
Kawachi	B...	20,800	1907	Apr., 1909	Oct., 1910	Apr., 1912	
Kongo	B.C.	27,500	1910	Jan., 1911	May, 1912	Aug., 1913	
Hiyei	B.C.	27,500	1911	Nov., 1911	Nov., 1912	.....	
Kirishima	B.C.	27,500	1911	Mar., 1912	Nov., 1913	.....	
Haruna	B.C.	27,500	1911	.....do....	Dec., 1913	.....	
Fuso	B...	30,000	1911	.....do....	.....	.....	
No. 2	B...	30,009	1913	.....	.....	.....	
No. 3	B...	30,000	1913	.....	.....	.....	
No. 4	B...	30,000	1913	Nov., 1913	.....	.....	

ITALY

Dante Alighieri	B...	18,600	1907	June, 1909	Aug., 1910	July, 1912	
Conte di Cavour	B...	22,340	1908	Aug., 1910	Aug., 1911	.....	
Giulio Cesare	B...	22,340	1909	July, 1910	Oct., 1911	.....	Trials, 1913
Leonardo da Vinci	B...	22,340	1909	Apr., 1910	.... do	.....	
Duilio	B...	22,040	1911	Apr., 1912	Apr., 1913	.....	
Andrea Doria	B...	22,040	1911	Mar., 1912	Mar., 1913	.....	
3 ships	B...	28,000	1913	.....	.....	.....	

RUSSIA

Sevastopol	B...	23,026	1908	June, 1909	June, 1911	.....	
Petropavlovsk*	B...	23,026	1908	.....do....	Sept., 1911	.....	
Gangut	B...	23,026	1908	.....do....	Oct., 1911	.....	
Poltava	B...	23,026	1908	.....do....	.....do....	.....	
Imperator Aleksander III.	B...	22,435	1911	Oct., 1911	Nov., 1913	.....	
Imperatritsa Maria	B...	22,435	1911	.....do....	.....do....	.....	
Ekaterina II	B...	22,435	1911	.....do....	.....do....	.....	
Navarin	B.C.	32,000	1911	Dec., 1912	.....	.....	
Borodino	B.C.	32,000	1911	.....do....	.....	.....	
Ismail	B.C.	32,000	1911	.....do....	.....	.....	
Kinburn	B.C.	32,000	1911	.....do....	.....	.....	

BRAZIL

Minas Geraes	B...	19,250	1906	May, 1907	Sept., 1908	Jan., 1910	
San Paulo	B...	19,250	1906	.... do	Apr., 1909	July, 1910	

AUSTRIA-HUNGARY

Viribus Unitis	B...	20,010	1911	June, 1910	June, 1911	Oct., 1912	
Tegetthoff	B...	20,010	1911	Sept., 1910	Mar., 1912	July, 1913	
Prinz Eugen	B...	20,010	1911	Sept., 1911	Nov., 1912	.....	
Szent Istvan	B...	20,010	1911	Jan., 1912	.....	.....	

CHILE

Almirante Latorre	B...	27,500	1910	Dec., 1911	Nov., 1913	.....	
Almirante Cochrane	B...	27,500	1910	Jan., 1913	.....	.....	

Recent battleships and armored cruisers of over 17,000 tons displacement built, building, or proposed—Continued

GREECE

Salamis	B...	19,500	1912	July, 1912	.....	.....	

TURKEY

Birindji Osman	B...	27,500	.....	Oct., 1911	Jan., 1913	.....	Bought from Brazil
Reshadieh	B...	23,000	1910	Dec., 1911	Sept., 1913	.....	

Vessels completed during 1913

ENGLAND

	Tons
Centurion, battleship	23,000
Ajax, battleship	23,000
Audacious, battleship	23,000
Australia, battle cruiser	18,800
Queen Mary, battle cruiser	27,000
Amphion, cruiser	3,440
Dublin, cruiser	5,400
Sydney, cruiser	5,400
Melbourne, cruiser	5,400
Fearless, cruiser	3,360
16 destroyers	15,018
8 submarines	6,480
	159,298

GERMANY

Kaiserin, battleship	24,306
König Albert, battleship	24,306
Prinzregent Luitpold, battleship	24,306
Seydlitz, battle cruiser	24,385
12 destroyers	6,636
6 submarines	4,800
	108,739

FRANCE

	Tons
Jean Bart, battleship	23,092
Courbet, battleship	23,092
6 destroyers	4,492
1 submarine	984
	51,660

JAPAN

Kongo, battle cruiser	27,500

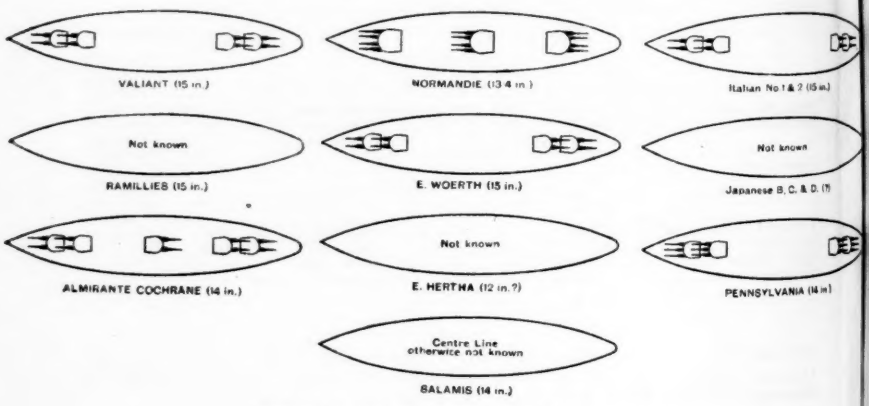
RUSSIA—none

ITALY

Nino Bixio, cruiser	3,470
Marsala, cruiser	3,470
4 destroyers	2,200
21 torpedo boats	2,415
4 submarines	1,200
	12,761

AUSTRIA-HUNGARY

Tegetthof, battleship	20,010
Saida, cruiser	3,484
3 destroyers	2,361
	25,855



DECK PLANS OF SHIPS LAID DOWN IN 1913

—*The Engineer*

NAVAL POWERS

ARGENTINE REPUBLIC

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Rivadavia.....	27,940	22.5	12 12-in., 12 6-in., 16 4-in.	Fore River Co.	Under trials
Moreno.....	27,940	22.5	same	New York Co.	Launched Sept. 23, 1911

NOTE.—Argentine has four destroyers, displacement 950 tons, contracted for (two built at Nantes and two at Bordeaux), launched in 1911 but not yet turned over to the government.

"RIVADAVIA."—The battleship *Rivadavia*, built by the Fore River Shipbuilding Corporation, on a 34-hour run, on St. Valentine's Day, exceeded her contract of 22½ knots, by half a knot, in spite of the severe weather prevailing at the time.—*The Marine Journal.*

ARGENTINE REPUBLIC.—The Argentine Republic has placed an order for four destroyers, each of 1250 tons displacement and to have a speed of 32 knots, with the Germania shipyard at Kiel. They are to be equipped with turbines of 30,000 i. h. p., the boilers to be served with oil fuel. Diesel motors are also to be installed.—*Marine Engineer and Naval Architect.*

RUMOR OF BATTLESHIP SALE.—The sale of the *Rio de Janeiro* to Turkey opens up some fields for speculation as to whether the Argentine battleships *Rivadavia* and *Moreno* may not eventually be found in the market, although official denials of such a step have already been made. It should not be forgotten that these vessels were ordered over four years ago, and after nearly two years work had been put in on comparative designs of all sorts and conditions by most shipbuilders in almost every country. As matters stand at present, only one vessel has yet been out on trial. At the earliest, they may be handed over to the Argentine Government during the coming summer, or about the same time as the *Queen Elizabeth*, which was ordered three years later than the *Rivadavia*. It is extremely doubtful whether the Argentine authorities, who exerted far more influence on the design of these ships in the way of general requirements than is usually supposed, are entirely satisfied with this outcome of their efforts, and consequently if one or both of these vessels were to be placed at the disposal of an immediate purchaser it would occasion no surprise. On her recent official trials the *Rivadavia* obtained a speed of 22.5 knots with 39,750 shaft horse-power and 270 revolutions, but considerable damage was afterwards found to have been caused to the turbine blading.—*Engineer.*

AUSTRIA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Prinz Eugen..	20,300	20	12 12-in., 12 5.9-in., 18-12 pdr.	Trieste	Launched Nov. 30, 1912
Szent Istvan..	20,300	20	same	Fiume	Launched Jan. 17, 1914
Ersatz Mon'ch	25,000	22½	10 14-in.	Trieste	To be laid down, spring 1914
" Budapest	25,000	22½	same	"	" " " " " 1914
" Wien....	25,000	22½	same	Fiume	" " " " " 1915
" Hapsburg	25,000	22½	same	Trieste	" " " " " 1915
Small Cruisers					
Saida.....	3,500	....	.....	Montalcone	Launched Oct. 26, 1912
Helgoland	3,500	....	.....	Fiume	" Nov. 23, 1912
Novara.....	3,500	....	.....	"	" Feb. 15, 1913

NOTE.—Three destroyers launched in 1913, displacement 787 tons, nearing completion. Five submarines, displacement 550 tons, contracted for in 1912 to be built by Krupp Co.

FOURTH DREADNOUGHT LAUNCHED.—The fourth Austro-Hungarian dreadnought was launched at Fiume January 17. Arch-Duchess Marie Theresa on behalf of the Emperor-King formally named the vessel *Szent Istvan.*

Laid down on January 29, 1912, the *Szent Istvan* was almost exactly two years on the stocks, The battleship was originally meant to be ready for her trials by next summer, but this is, of course, out of the question now, and the commissioning date has been provisionally fixed for the summer of 1915. The *Szent Istvan* is virtually a sister ship to the *Viribus Unitis*, but unlike the first three vessels of this class, which are equipped with Parsons' turbines and Yarrow boilers, she is to be fitted with German A. E. G. turbines and Babcock & Wilcox boilers. The belt amidships is 11-inch K. C., with 6-inch bulkheads, and a 1¾-inch protective deck. The turrets and conning-tower also carry 11-inch armor. The armament remains the same, viz., twelve 12-inch 45-caliber, twelve 6-inch 50-caliber, and eighteen 10-pounders.

The *Prinz Eugen*, the third ship of this class, will begin her trials in April.—*Naval and Military Record.*

SCOUT-CRUISERS.—The scout-cruisers *Helgoland* and *Novara*, completing at the Danubius dockyard, Fiume, will be ready for their trials in a few weeks. They were laid down in October, 1911, and February, 1912, respectively. They are identical with the *Saida*, recently delivered from the Cantiere Navale at Trieste, and now making trials, and very similar to the *Admiral Spaun*, which has proved a singularly successful vessel. The only point of difference is in armament, the *Spaun* carrying seven 4-inch q. f., and the three later ships nine 4-inch apiece. The displacement of all four is 3500 tons, and the designed speed 27, which has been considerably exceeded by the *Spaun*. Protection to vitals is afforded by a 2½-inch nickel-steel belt and a ¾-inch deck. All burn coal and oil. The construction of this fast and homogeneous division of scouts is due to the late Marine Commandant, Admiral Count Montecuccoli, who pointed out to the Delegations how badly the fleet was handicapped by the lack of small and speedy ships for reconnaissance duties. The class compares very favorably with the Italian *Quartos* and *Bixios*.

In all probability two greatly improved scouts will be laid down for the Austrian Navy this year to counter-balance the Italian *Mirabellos*, which are to be ships of 5000 tons, 29 knots, and have an armament of 6-inch q. f.

The only other light cruisers available for scouting work are the *Aspern, Zenta,* and *Szigetvar,* with an original speed of 20 knots, but these are old and cannot be relied upon for steady work. They will probably be reboilered and otherwise renovated.—*Naval and Military Record.*

NEW CRUISERS.—*Die Zeit* states that three cruisers of an improved *Novara* type will be commenced within the next four years. They will have a displacement of 4800 tons, and a speed of 29 knots, but the armament has not yet been decided upon.

The six destroyers which were commenced at Fiume in the autumn of 1912 are all practically finished. The first three have completed their trials, and the remainder were launched during November in an advanced stage of construction. These vessels have a displacement of 800 tons and a designed horse-power of 17,000, giving a speed of 32.5 knots. The armament consists of two 4-inch and six 3-inch guns, and two 21-inch torpedo tubes.

SUGGESTED AUSTRO-ITALIAN FLEET EXERCISES.—Proposals were recently made by certain journals in Italy regarding the holding of joint maneuvers between the Italian and the Austro-Hungarian fleets. The project has now been revived in a more definite form, and an article is devoted to it in a recent number of *L'Italia Marittima.* This journal remarks that although joint land maneuvers by the allies are impracticable, since they would involve the presence of armed troops on foreign territory, combined naval maneuvers would offer no such difficulty, and are, in fact, quite possible, while they would be of incalculable value for both sides. For Austria-Hungary to wage a future naval war without Italy, or vice versa, against one or more of the great powers is out of the question, in view of modern political conditions. The possibility of a joint naval war by the two Adriatic powers is not merely admitted in competent quarters, but has even been considered and discussed down to the last details. The usefulness of joint fleet exercises, continues the paper, should be recognized, so that in time of war the two allied fleets may be prepared and trained to fight together successfully against a common foe, both forces being directed and controlled by a single command. On the high seas there can be no question of the betrayal of military secrets, as the outward appearance of every ship is well known, and a closer contact could be avoided. *L'Italia Marittima* concludes by suggesting that in preparation for such combined action a joint Austro-Italian signal code should be drawn up.

It is impossible to say to what extent suggestions of this nature find favor in official circles in either country, but so far, at all events, they have not been endorsed by the leading service journals, and it is therefore unnecessary to take them too seriously at present.

It is reported in Rome that the Italian Government has now decided to hand over to Turkey the warship *Drama,* which was building at the Ansaldo yard to Turkish order when the Libyan war broke out, and was then seized by the Italian Government. The Ottoman authorities are willing to pay for the ship without delay, so that it will shortly be transferred to the Turkish flag. The *Drama* is a protected cruiser of 3800 tons, with a designed speed of 22 knots, and is armed with two 6-inch and eight 4.7-inch quick-firers. There is a 4-inch steel deck amidships. The vessel is practically identical with the cruiser *Hamidieh.*—*Naval and Military Record.*

NAVY LEAGUE PROPAGANDA.—The Austrian Navy League, which has lately almost doubled its membership, and now enjoys great influence, has presented a petition to the Austrian Delegation, in which the following demands are formulated:

(1) The replacement of ships which have reached the age limit should be an automatic procedure, provided for in the ordinary estimates.

(2) Funds should be authorized for building a number of foreign service cruisers, thus making possible a dignified representation of the Monarchy abroad without enfeebling the active fleet at home by detaching ships.

(3) A program should be introduced for adding to all classes of ships, in order to maintain the fleet at least at its present standard of strength.—*Naval and Military Record.*

BRAZIL.

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleship					
Rio de Janeiro	.....	..	.....	Armstrong, Whitworth & Co.	Contracted for Feb., 1914

NOTE.—Three submarines, contracted for in 1912, to be built at Spezia, displacement 330 tons, were ready Aug. 1, 1913, and two have been turned over to the government.

LAUNCH OF A NAVAL COLLIER.—On February 12 there was launched from the Werf Gusto of the firm of A. F. Smulders, of Schiedam, Holland, the steel hull of a self-propelling coaling vessel, which is the first of two identical boats now being built for the Brazilian Admiralty. This coaling vessel, which it is intended shall follow the fleet on service, has a hold capacity of 1000 tons, and can discharge her cargo automatically at the rate of 500 tons per hour. Her principal dimensions are length 167 feet 2 inches, breadth 40 feet 4 inches, and depth 18 feet 4 inches. She is fitted with two propellers driven by two compound steam engines of 500 indicated horse-power. Each of these engines is of sufficient power for driving the automatic discharging apparatus, whilst an engine of 120 indicated horse-power has been provided for the mechanical loading of the vessel itself. There are, in addition, the necessary warping and anchor winches, whilst the vessel is electrically lighted throughout. The steam for these engines is supplied by a boiler having a heating surface of 1620 square feet and working at a pressure of 120 pounds. The vessel has been built under special survey of the Bureau Veritas.—*Engineer.*

SALE OF THE "RIO DE JANEIRO."—The battleship *Rio de Janeiro* has now been taken over by the Turkish Government, but it is the intention of Brazil to construct a new vessel in her place. Writing to the *Daily Telegraph* on January 7, Captain J. F. Martins-Guimaraes, of the Brazilian Navy, said that Brazil was a country with a sea coast 4000 miles in length, with an area nearly fourteen times larger than France, and with a population of more than 25,000,000 inhabitants. The dreadnoughts which she had in service she had never thought of disposing of, because they were needed for her defence. Regarding the sale of the *Rio de Janeiro,* Captain Martins-Guimaraes said: "I do not know the reason why my government disposed of our ship, but I think it is only because, if we have to alter the type, we could do with a better class of ship. Then, when we need more, we could have two or more homogeneous divisions, the *Minas Geraes* and *Sao Paulo* forming one, and those we start now, with 15-inch guns or larger, the other divisions."—*United Service Magazine.*

There seems to be no doubt that the Brazilian battleship *Rio de Janeiro* has been bought by Turkey. Her disposition of seven turrets in the center line is absolutely unique. It may foreshadow possible future developments in super-dreadnoughts; but it is never likely to be surpassed by any design in which twin turrets are embodied. Armstrongs, the builders of the *Rio de Janeiro,* have accepted the proposal officially made by the Brazilian Government to construct another dreadnought without any loss to the Brazilian treasury.—*Engineer.*

CHILE

VESSELS BUILDING

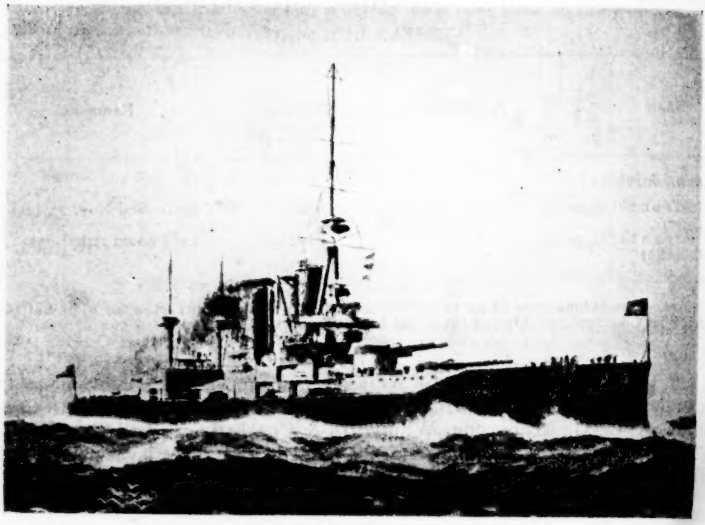
Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Almirante Latorre	28,500	23	10 14-in., 20 4.7-in.	Vickers	Launched Nov. 27, 1913
Almirante Cochrane	28,500	23	same	Elswick	Laid down April, 1913

NOTE.—Two submarines of 420 tons displacement have been contracted for to be built by Elec. Boat Co., Seattle. One of these has been launched.

THE CHILIAN DREADNOUGHT "ALMIRANTE LATORRE."—On November 27, 1913, the *Almirante Latorre*, the first of the two dreadnought battleships which Sir W. G. Armstrong, Whitworth & Co., Ltd., are building for the Chilian Government, was successfully launched at the Elswick shipyard. The *Almirante Latorre* has the following approximate dimensions:

Length, over all, feet	661
Length between perpendiculars, feet	625
Breadth, feet	92
Depth, molded, feet and inches	43.9¾
Mean draft, feet and inches	28.6
Displacement, tons	28,000

The *Almirante Latorre* and *Cochrane* will not only be the largest and most powerful battleships in the Chilian Navy, but they will rank as the largest vessels yet constructed by Sir W. G. Armstrong, Whitworth & Co., Ltd. The main propelling machinery of the *Almirante Latorre* is being supplied by Messrs. John Brown & Co., Ltd., of Clydebank, and consists of two sets of Parsons' marine turbines working on four shafts, and of approximately 37,000 shaft horse-power, sufficient to give the battleship a speed of 23 knots. There are twenty-one boilers of the Yarrow tube type (pressure 250 pounds per square inch). Both coal and oil fuel will be used. The main armament comprises ten 14-inch guns, whilst the secondary armament will consist of sixteen 6-inch guns, four 3-inch guns, two 76-mm. 12-pounder boat guns, and four Maxim machine guns, or a total main and secondary armament of thirty-six guns and four 21-inch submerged torpedo tubes. The armament is being manufactured by Sir W. G. Armstrong, Whitworth & Co., Ltd., at whose works at Openshaw are also being manufactured the armor plates employed in this battleship. The complement of the ship will be 1075 men. The *Almirante Latorre*, named after a distinguished officer of the Chilian Navy who died some two years ago, is the ninth war vessel constructed by the Armstrong firm for the Chilian Government. The first was the *Esmeralda*, of about 3000 tons, built at the Walker shipyard in 1884. The others were the *Blanco, Encalada, Ministro Zenteno*, the second *Esmeralda, O'Higgins, Chacabuco, Captain Thomson* and *Jenera Baquedano*, all of which were built at the Elswick shipyard. Inclusive of the *Almirante Cochrane*, their displacement aggregates 90,000 tons, with about 159,000 horse-power.—*Shipbuilding and Shipping Record.*



CHILIAN BATTLESHIP "ALMIRANTE LATORRE"

The propelling machinery is peculiar and consists of a combination of Parsons' and Brown-Curtis turbines, fitted for improved economy. The low pressure turbines will be of Parsons' design and the high of Brown-Curtis.

TWO NEW DESTROYERS.—The torpedo-boat destroyers *Lynch* and *Condell* have now been completed, and crews to man them arrived at Cowes from South America in the first week in January. These boats are the first of a class of six whose construction was ordered in 1911, all being allotted to Messrs. J. S. White & Co., of East Cowes. They are among the most powerful destroyers yet built for any navy. Each boat has a displacement of 1500 tons, engines of 27,000 horse-power, a speed of 31 knots, and an armament of six 4-inch guns and three torpedo tubes. The propelling machinery is of the Parsons' turbine type, with steam supplied by White-Forster boilers, arranged to burn both coal and oil, of which about 420 and 80 tons can be carried respectively. The complement of each vessel includes ten officers and 150 men.—*United Service Magazine.*

CHILE'S SUBMARINES.—One of the most picturesque launchings ever held on the Pacific coast occurred December 31, when the submarine *Antofagasta,* built by the Seattle Construction & Dry Dock Co., for the government of Chile, took her initial dip in the waters of Seattle harbor. The *Antofagasta* is a sister craft to the *Iquique,* launched at the same yards June 2, 1913. Both vessels were constructed under the supervision of T. S. Bailey, Pacific coast manager of the Electric Boat Co. The *Iquique* will be given her tests this month on Puget Sound, and the *Antofagasta* immediately thereafter. They will then be towed to Chile. At the christening of the *Antofagasta* were representatives of many nautical, commercial and civic organizations, besides members of the Chilean Naval Commission, navy and government, the latter represented by Consul L. A. Santander.—*Shipping,* Illustrated.

CHINA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Light cruisers					
Fei-Hung	2,600	..	.....	N. Y. Ship Bldg. Co.	Launched May 4, 1912
.....	4,800	27	.....	Monfalcone	Ordered Nov., 1913
.....	1,800	24	.....	"	Contracted for Sept., 1913
.....	1,800	24	.....	"	same
.....	1,800	24	.....	"	same

NOTE.—Four destroyers, displacement 400 tons, are building, one at Trieste and three at Schichau.

CHINESE CRUISER "FEI HUNG."—The *Fei Hung* is a light cruiser, built for the Chinese Navy for use primarily as a training ship; she is also available for all the war functions that can be expected from a vessel of this size and type. She is a deck-protected cruiser, driven by turbine machinery and carrying an armament fully up to the standard of her class.

The *Fei Hung* was built by the New York Shipbuilding Company of Camden, New Jersey, from outline requirements supplied by the Chinese Government; she is of the same general type as the *Ying Swei* and *Chao Ho*, recently completed in England. Some latitude was allowed the builders, so that all these ships have minor differences in arrangement and motive power, notably in the matter of boiler power. What follows relates only to the *Fei Hung* unless specially noted.

The outline data of the hull is as follows:

Length over all, feet and inches	322–00
Length between perpendiculars, feet and inches	320–00
Beam, molded, feet and inches	39–00
Depth, feet and inches	22–06
Normal displacement, tons	2600
Normal draft, feet and inches	14–00
Freeboard forward, feet and inches	18–03
Normal complement, total	230
Bunker capacity, coal, tons	600
Bunker capacity, oil fuel, tons	100
Full forecastle, length, feet and inches	87–00
Full poop, length, feet and inches	58–00
Double bottom, under machinery, feet and inches	117–00
Deck protection, on flat, inches	01
Deck protection, on slopes, inches	02

Bunkers (coal) above and below the protective deck, amidships.

The officers are berthed in fifteen staterooms forward in the forecastle and on deck; the crew are in large compartments on the berth deck and in the poop. A large sick bay is fitted in the poop. Galleys are on deck amidships. Magazines are located in a platform deck, both forward and aft, with storerooms, etc., below in the holds, thus ensuring a maximum of protection. The oil fuel is carried in suitable compartments at each end of the machinery spaces.

Trimming tanks, potable water, reserve feed tanks and water-ballast tanks are provided.

Cold-storage compartments are fitted on the protective deck abreast the engine hatch. Stowage for torpedoes is provided below deck.

The weather decks are wood sheathed. Under the bridge an armored conning-tower and communication tube are fitted.

A very complete outfit of boats is provided, including one steam launch and one motor whaleboat; there are eight boats and rafts in all. Anchors, chain and lines are provided as customary for vessels of this class.

Dismounting bogies, auxiliary davits, etc., are provided for handling guns, ammunition and stores.

The ship is fitted with a wireless-telegraphic outfit, the masts being of extra height to carry the aerials.

Armament

The vessel is armed as follows: Two 6-inch guns, 50 calibers, with shields; four 4-inch guns, 50 calibers, with shields; two 3-inch guns; six 3-pounders; two 37-millimeter automatics; two 18-inch deck torpedo tubes; small arms for crew

The 6-inch guns are located one on the forecastle and one on the poop; the 4-inch are on the main deck at the breaks of poop and forecastle; the 3-inch, 3-pounders and torpedo tubes are arranged along the waist, and the automatics on the forecastle deck under the bridge. All this armament, including the first supply of ammunition, was supplied by Sir W. G. Armstrong, Whitworth & Company, of England, in order that the armament of all the ships should be of similar make, using the same ammunition. The automatics are by Vickers, Limited. The gun trials were successful in every respect. Several rounds per gun were fired with full charges at varying degrees of train, followed by a broadside; this trial was carried out in connection with the speed trials. Armored hoists, electrically operated by 3-horse-power motors, are fitted to each 6-inch gun; the other guns being served by hand whips. Torpedoes are stowed in boxes on deck and below in a special space. A dummy torpedo was fired from each tube both by compressed air and by a powder charge whilst at the builder's works. On the trials, an actual torpedo, with practice head, was fired by air.

Propelling Machinery

This vessel is fitted with an installation of Parsons' turbines of the regular standard all-reaction type and design, which has proven so successful in vessels of this type. The machinery is arranged in one engine room, and there are three lines of shafting, with one propeller on each shaft.

The high-pressure ahead turbine drives the center shaft and has fifty-six rows of blades in the casing, and a similar number on the rotor, whilst the diameter of the rotor is 39 inches. At the forward end of this turbine a cruising element is arranged, which has an additional sixteen rows of blades in casing and rotor respectively. This stage helps to improve the economy of the turbines at cruising speeds.

A combined low-pressure ahead and astern turbine drives each wing shaft, the low-pressure ahead turbines having sixty-four rows of blades in casing and rotor respectively, with a drum diameter of 55 inches. Each astern turbine has forty rows of blades in casing and rotor respectively, drum diameter being 44 inches.

The turbine bearings are supplied with oil under pressure, whilst the line-shaft bearings are lubricated on a ring system.

The turbine machinery worked most satisfactorily throughout all the trials, and the turbine-bearing journals retained a constant temperature at all times. Heavy weather was experienced between the runs, with excessive rolling of the ship, but this did not appear to affect the steady running of the turbines either at high or low speeds.

Dummy readings were taken regularly throughout the runs and showed that the rotors were floating under nearly all running conditions, with consequently very light loads on the turbine adjusting blocks.

Auxiliary exhaust connections are arranged at different stages throughout the turbines, so that full use can be made of any available exhaust steam which the feed heater does not use and would otherwise be discharged directly into the condensers.

On the completion of the trials the turbine bearings and thrust rings were opened out for examination and found to be in splendid condition. The turbine casings were not opened out for inspection for the reason that the operation of the turbines throughout the trials was very satisfactory. Further, the joints of the turbine casings never showed any signs of leaking under full-power conditions, and it was therefore considered unnecessary to open up the turbines.

The turbines were built by the New York Shipbuilding Company under license from the Parsons' Marine Steam Turbine Company.

Boilers

The boilers are of the Thornycroft Express type, three in number, located in two boiler rooms, one in forward room and two in after room, all on the center-line of the ship, flanked by the coal bunkers and with a cross bunker leading to each boiler for use in action. The total heating surface is 14,493 square feet and the grate surface 270.75 square feet, working pressure 240 pounds per square inch. The forward boiler is fitted with an auxiliary oil-fuel plant, worked on the mechanical-spray pressure system. The stokehold is closed, and air forced in by means of blowers, one to each boiler.

Reduced to a uniform displacement of 2600 tons, the curve of speed and power is as follows:

Speed in knots	S. H. P.
12	945
14	1,705
16	2,905
18	4,630
20	6,560
21	8,640

The torsionmeters used were of Fottinger type.—*Journal Soc. Amer. Naval Engs.*, by E. H. Rigg.

CHINA'S NEW DESTROYERS.—The two destroyers built by the Schichau Company for the Chinese Government have been completed and delivered at Shanghai. These vessels, the *Chang Feng Po* and *Fei Yun* arrived safely after a good run from Germany. On account of the long journey special turbines were fitted on these craft.—*Mitt. aus dem. Geb. des Seew.*

OIL-BURNING SCOUTS.—The particulars of three scout-cruisers building for the Chinese Government at the Cantiere Navale Triestino, near Trieste, Austria, are as follows: Length 359 feet, beam 39 feet, draft 16 feet; Parsons' turbines, designed horse-power 30,000 = 32 knots; armament, ten 4-inch q. f., two Maxims, and two torpedo tubes; Yarrow boilers for coal and oil fuel. The guns are being made by the Skoda Works. The ships are to be delivered in 22, 24 and 26 months respectively. According to their designed speed these ships will be the fastest scouts in the world, while their armament does not compare unfavorably with that of scouting vessels in other fleets.—*Naval and Military Record.*

NAVAL SCHEME IN ABEYANCE.—Reuter learns that the Chinese Government, having come to the conclusion that economic and commercial development demand earlier attention than the expansion of the navy, has decided not to proceed with its scheme announced last October for the establishment of a naval college and a naval base. Consequently the negotiations which were commenced with the British Admiralty for the

loan of officers and the despatch of a British naval mission to China are in abeyance.—*Naval and Military Record.*

Orders have been placed with an Austrian shipyard near Triest for three armored cruisers, and twelve destroyers with the Triest shipyard, six destroyers with the Vulcan shipyard at Stettin, two gunboats and five river gunboats with the Kiangnan Dock & Engine Co. at Shanghai. It is reported that further orders are to be issued shortly.—*Marine Engineer and Naval Architect.*

NAVAL ADVISERS: NEW RIVER CRAFT.—The group of British officers who are to proceed to China under the direction of Captain Harold Christian, R. N., for instructional purposes, had not left for the Far East in January. Six officers were required for the mission, but the services of only three had been secured. Two gunboats named the *Monocacy* and *Palos* have, according to the *Practical Engineer,* been built at the Mare Island Navy Yard, U. S. A., for shipment in sections to China, where they are to be reconstructed at the works of the Shanghai Docks and Engineering Co. Each boat has two quick-firing guns, and is intended for use on the Chinese rivers.—*United Service Magazine.*

DENMARK

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Niels Juel.....	3,675	16	2 9.4 in., 4 5.9-in.	Copenhagen	Laid down Sept., 1913

NOTE.—Three destroyers are under construction at Copenhagen and three submarines, displacement 200 tons, are being built by Whitehead Co.

The personnel of the navy for 1913-1914 will be as follows: 1 vice admiral, 2 rear admirals, 17 captains, 45 commanders, 72 "Oberoffiziere" and 7200 petty officers and enlisted men.

A new armored coast defence ship, to be called the *Niels Juel,* has recently been laid down. Designed in 1911, but with subsequent alterations and improvements her characteristics are as follows: Tonnage displacement, 3670; horse-power (2 engines), 5400; speed, 16 knots; armament, two 24-cm. guns, four 15-cm. guns, 4 under-water torpedo tubes; armor, from 100 to 180 mm. thickness.

The last armored ship built for the Danish Navy was launched in 1908 and is of the same characteristics as the *Niels Juel.*

Three small destroyers and three submarines are now under construction in Copenhagen. The names of the destroyers are, as already given, *Delfinen, Hvalrossen* and *Svaerdfisken.* These ships will be equipped with the Normand turbines, Havre, France. With a displacement of 250 tons they will make 27 knots.

The Whitehead Company, of Fiume, are superintending the building of the three submarines. These boats have a displacement of 230 tons when submerged.

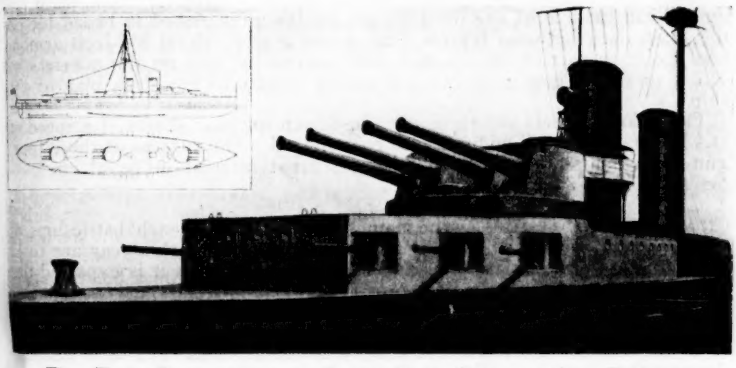
The cruiser *Valsyren* has had an extensive overhaul; boilers retubed, decks renewed, two new 90-cm. projector search-lights fitted, a new wireless installation, and her old battery of two 21-cm., and two 15-cm. guns has been replaced by two 15-cm. quick-firers and six 7-cm. rapid-fire guns.—*Mitt. aus dem Geb. des Seew.*—Translated by Lieut. C. B. Mayo, U. S. Navy.

FRANCE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
France	23,092	21	12 12-in., 22 5.5-in.	St. Nazaire	Launched Nov. 7, 1912
Paris	23,092	21	same	La Seyne	" Sept. 28, 1912
Bretagne	23,172	20	10 13.5-in., 22 5.5-in.	Brest	" April 21, 1913
Provence	23,172	20	same	Lorient	" April 20, 1913
Lorraine	23,600	20	same	St. Nazaire	" Sept. 30, 1913
Languedoc	25,200	21	12 13.5-in., 24 5.5-in.	La Seyne	Laid down May 1, 1913
Normandie	25,200	21	same	St. Nazaire	" May 1, 1913
Flandre	25,200	21	same	Brest	" Oct. 10, 1913
Gascogne	25,200	21	same	Lorient	" Feb. 10, 1913

NOTE.—There are approximately six destroyers and 23 submarines under construction.



THE FIRST BATTLESHIPS TO CARRY FOUR GUNS IN ONE TURRET

The *Normandie*, one of four French ships, of 25,387 tons and 21.5 knots. Armament: Twelve 13.4-inch guns in three turrets, carrying 17½-inch armor; twenty-four 5.5-inch guns, protected by 8¼-inch armor.

THE FOUR-GUN TURRET.—Time was in the French Navy when the authorities favored the placing of only one gun in a turret. Theoretically, so far as the rapidity and accuracy of gun fire are concerned, that was the ideal arrangement. But French naval authorities are distinguished for the great variety and suddenness of the changes which they introduce. To-day the pendulum has swung to the other extreme, and in the four latest dreadnoughts, the *Normandie, Gascogne, Languedoc,* and *Flandres,* the French are putting four guns in a single turret—and this at a time when the two leading naval powers, Great Britain and Germany, are still using only two guns per turret.

The *Normandie* class are big ships, 574 feet long, 92 feet beam, 28¼ feet maximum draft, and they displace 25,387 tons. The armament is heavy, consisting of twelve 13.4-inch guns carried in three four-gun turrets. The foremost gun is carried above a superstructure on the forecastle deck, the axes of these guns being surely not less than 36 feet above the water-line. Amidship above the spar deck is the second turret; and aft above the main deck is turret number 3.

The 13.4-inch gun is a powerful weapon, 45 calibers in length and firing a shell weighing 1433 pounds, which is slightly heavier than the shell of our 14-inch guns, with a velocity of 2657 feet, which is slightly greater than that of our 14-inch piece; so that although of less bore, this French gun must be of somewhat greater power than ours.

The advantages of the four-gun turret are that there is considerable saving in weight of armor and gun carriages, and of ammunition lifts and gun-operating mechanism. Also it conduces to good shooting, for the reason that four shots fall in one place, and the work of the spotter is facilitated. It is believed that the guns are not mounted in one sleeve, but in pairs in two sleeves; but possibly the two sleeves are connected to a common elevating mechanism, in which case all the advantages of a single sleeve are secured. The theoretical disadvantage of the four-gun turret is that a single heavy armor-piercing shell, penetrating such a turret, may put four guns out of commission at once.

These ships are heavily armored, carrying about 13 inches on the belt, 17½ inches on the main turret, and 10 inches on the sides of the ship above the main armor belt. The secondary battery of twenty-four 5.5-inch guns is carried as follows: Six in a battery protected by 8¼-inch armor, situated forward of No. 1 main turret, on the forecastle deck, these six guns being capable of fire dead ahead; twelve guns placed in broadside on the main deck between turrets Nos. 1 and 2 and behind 8¼-inch armor; and six guns carried on the gun deck abreast of and on the quarters of No. 3 turret. These positions are shown clearly in our deck plan of the ship.

These four vessels are to be turbine-driven on four shafts at a speed of 21.5 knots. They will be fired with coal and oil. The success of these four-gun turret ships will be watched with great interest in naval circles.—*Scientific American.*

1914-1915 BATTLESHIPS.—The names of the four French battleships of the 1914-1915 program that it is proposed to lay down this year are to be *Lyon, Lille, Duquesne* and *Tourville.* In general design it is expected that they will follow closely the design of the *Normandie* class, except that they will be materially heavier, displacing nearly 29,000 tons. This increase of size is mainly devoted to the introduction of a fourth center turret, which, as in the vessels laid lown last year, will contain four 13.4-inch weapons. Apparently, French artillerists prefer increase in number to increase in caliber at the present time, whereas both English and United States opinion is distinctly tending in the opposite direction. The actual design, however, is not yet definitely settled, and it is quite possible that in view of the very keen criticism that is being directed at the 1914 program considerable modification may be made in the design.—*Engineer.*

PROGRESS OF NEW CONSTRUCTION.—*Utilization of Pre-Dreadnoughts.*—The 23,457-ton *France* and *Paris,* laid down in November, 1911, two months before the British *Iron Duke,* have on board the whole of their artillery, and will be commissioned next month for their preliminary trials. An effort will be made to have them completed by the end of July, though this will not be easy when it is remembered that the *Courbets,* ready for their trials in April last year, only joined the fleet in November. They are confidently expected to prove the fastest French battleships up to date. They ought to exceed the record of the *Bart* (Bellevilles), which reached 23 knots, and also to equal at least the performances of the Italian *Vincis,* which have finer lines, but inferior motor power (24,000 against 29,000). These nominal figures are, in truth, little to go by, being usually much exceeded in practice. The *Bart,* for instance, developed 42,000 horse-power instead of 29,000, and the Italian *Cesare* did even better, registering 39,000 horse-power in lieu of 24,000, an increase of 15,000 horse-power, the speed performances of the two rival dreadnoughts being very similar.

The comparative capabilities of French and Italian dockyards are illustrated by the rate of construction of these ships. Though the *Frances* were commenced from 15 to 18 months after the *Italians*, they will hoist the pennant only a few months after the *Cesare* and *Vinci*, which are completing their trials, and have every chance of entering the service before the *Cavour*, now preparing for her steaming tests, but still without part of her armament. At the same time, it is not expected that France will in the future be able to preserve anything like the same margin of superiority, the Italian Admiralty having just adopted energetic measures to do away with causes of delay similar to those experienced in the case of her first batch of dreadnoughts, and having spared no effort to ameliorate the resources of her dockyards. The effect of these improvements is already being felt with the *Duilio* and *Doria*, progressing at a faster rate than their predecessors, and certain to compare more favorably with their French contemporaries of the *Bretagne* class.

Our first super-dreadnoughts of the *Orion* class (ten 13.4-inch guns) are being pressed forward with the utmost vigor, the vital importance being realized in high quarters of having these powerful units as promptly as possible in service, so as to restore to the French side the supremacy in the Middle Sea, which at present belongs to the Triple Alliance. The *Bretagne* and *Provence*, launched in April last year, have on board their funnels, masts, most of their gun mountings, and part of their artillery. Should the present rate of progress be maintained, they will run on their preliminary trials in September next, and become available by the end of the year. Their sister ship *Lorraine*, launched five months since at St. Nazaire, is far from being so advanced, though the contractors are confident of being able to deliver her several months before the stipulated time. The three *Bretagnes* will array together a broadside of thirty guns of 13.4-inch, to which the Austro-Italian 12-inch ships could make no adequate answer.

The 25,300-ton *Normandie*, *Languedoc*, *Flandre* and *Gascogne* are to be floated, the two first-named in May-June, and the others in the late summer, thus about one year before their belated sister ship *Béarn*. These fine super-dreadnoughts, it is interesting to note, not only mark a departure in their armament and motors, but they also embody a series of practical improvements of no mean value. Whereas, for instance, French ships have actually to coal at a rate of 100 tons per hour, the future quadruple turret units are designed for a rate of 300 to 450 tons per hour.—*Naval and Military Record.*

THE 1914 SHIPBUILDING PROGRAM. SERIES OF REFORMS.—The new government has under pressure of public opinion, recognized the vital importance of an efficient navy, and the Minister of Finance, departing from his hostility to naval expansion, has decided that an extraordinary expenditure of 420 million francs, to spread over five years, shall be added to the 1914-18 yearly estimates, with a view to accelerating the completion of the Lapeyrère program. This opens bright prospects for the future. The present, unfortunately, is less satisfactory. As a consequence of grave modifications to the 1914 budget, France will be this year taking something like a naval holiday, at the very moment when her Mediterranean rivals are making unprecedented efforts to assert the mastery of the Triple Alliance in the Middle Sea. In this respect the recent change of Ministry must be pronounced disastrous. Mons. Baudin had, it will be remembered, arranged to take in hand, in addition to the fifth quadruple-turret ship *Béarn*, considered as a supplementary unit, four super-dreadnoughts of 29,500 tons and 16 guns of 13.4-inch, to be simultaneously laid down on January 1, 1915. These ambitious plans have been abandoned, and the naval law, which was supposed to be binding to our successive Ministers, has even been disregarded. Of the two battleships due to be commenced in 1914, one is to be the *Béarn*, ordered at the Forges et Chantiers de la Méditerranée on January 7, and to be laid down in June, whilst the other is dropped and nominally replaced by three scouts, which, together with five submersibles and a small minelayer, make up the list of vessels to be placed in hand in the course of the present year. This very modest program, the smallest since

1909, contrasts unfavorably with those of Italy and Austria, which are expected to commence this year between them seven or eight super-dreadnoughts. No wonder it fails to give satisfaction to the numerous Parliamentary partisans of naval expansion.

Naval men approve the construction of scouts, the need of which the 1913 maneuvers conclusively demonstrated. They will cost 18 million francs (£720,000), per unit, and will be ordered in private yards late in the year. The plans prepared by the Section Technique are being revised with a view to obtaining greater speed, 27 knots being judged, and with reason, totally inadequate in these times of 30-knot battle-cruisers. It is understood no change is to be made in the armament of ten 5.5-inch weapons of these three boats, which are not expected to be ready before the end of 1916, and have some chance to be outclassed at that date. The total absence of destroyers is a matter for regret, and will cause France to lose the advance she had gained over Italy and Austria in that line of construction.

It is the intention of Mons. Monis, who is a firm partisan of naval expansion, to fully make up for the smallness of this program next year, when the completion of many units now in hand will permit new ships to be commenced without entailing much increase in the estimates. This course, it is confidently stated, offers little danger owing to the superiority of French construction, which will allow super-dreadnoughts ordered early in 1915 to be ready at the same time as the 1914 Austro-Italian ships.

The constructional expenditure will be this year very heavy, amounting to nearly 276,000,000 francs, out of which 217,000,000 for ten battleships (two *Frances*, three *Bretagnes*, and five *Normandies*), 15,000,000 francs for three scouts, and the rest for torpedo, mining, and aircraft. There will be completed in 1914 the 23,457-ton *France* and *Paris*, originally due to be ready in July, but now not likely to join the fleet before September 1; the 760-ton destroyers *Bory* and *Lucas*, and twelve submersibles, one of 800 tons, three of 520 tons and 17 knots, and eight of 410 tons and 14 knots. There will remain in hand by January 1, 1915, the super-dreadnoughts *Bretagne*, *Provence* and *Lorraine*, advancing at an unprecedented rate, and certain to be completed early next year, and the 25,300 ton *Normandie*, *Languedoc*, *Flandre*, and *Gascogne* (all to be floated in the spring and summer, 1914), plus the belated *Béarn* that has no chance to become available before the spring, 1917, thus two years after the division of *Bretagnes* she is intended to complete, without mentioning 26 vessels of less importance.

Minister Monis is shortly to submit to the Conseil Superieur a series of reforms concerning the organization of the battle fleet and the utilization of the naval personnel. No change is intended in the present distribution of our battle squadrons, but it is felt that the "Division des Ecoles," of Read Admiral Darrieus, which is to include six old battleships of 12,000 tons, absorbs rather too many ships and too great a personnel, and represents to some extent a wasted force. It is proposed either to reduce its importance or to organize it as a real fighting squadron, to train periodically with the battle fleet on the high sea. As to the personnel, the abnormal number of officers and warrant officers (maîtres) who have left the service in the course of the past year points to the need of doing away with injudicious innovations introduced in the service routine and in the rules presiding over promotions. The abuse of examinations, especially, has driven out of the fleet numerous non-commissioned officers, with only rudimentary education, but possessing practical knowledge and experience far more valuable than mere book attainment. This loss is unanimously deplored, and a reform in the right direction will be welcomed.—*Naval and Military Record.*

A Cherbourg telegram states that during exercises by the torpedo-boat flotilla in February one of the vessels ran ashore. A hole was driven in her hull, and the crew were taken off with some difficulty by a lifeboat.—*Central News.*

THE ESTIMATES FOR 1914. AERONAUTICAL PROGRESS. COST OF SHIPS. BRITISH NAVAL VISIT TO BREST.—The navy estimates for 1914 afford unmistakable proof of the determination of France to vigorously pursue the strengthening of her fleet. They amount to no less than 623,000,000 francs (nearly £25,000,000), including 488,000,000 francs provided for by the annual budget, and 135,000,000 to be part of a loan of 420 million francs for the navy. They are slightly superior to the German 1914 estimates, and considerably exceed the combined Austro-Italian expenditure for the present year. Though they admittedly comprise too large a shares for purely administrative expenses and for other unproductive items, they will enable good progress to be made with the ten battleships in hand, and increased attention to be devoted to war preparation in all its branches, without mentioning important improvements in the plant and equipment of arsenals, the benefit of which will be felt next year, when four capital ships will probably be commenced. After new construction, which absorbs in the estimates the lion's share—£11,000,000—come in order of importance the credits for artillery, which amount to 140,000,000 francs (£5,600,000), and, besides providing for the armament of units in hand, will serve to hasten the time when our battle fleet will possess its full complement of reserve guns and ammunition. The resources of the much-criticised state powder factories are also to be increased. Additional expenditure had to be provided for the manning and upkeep of coastal and harbor defences, an item lately transferred from the Ministry of War to the Admiralty, as well as for heavier guns (305 and 340 mils.) for coastal batteries. Other innovations concern the appropriation of 19,000,000 francs, with a personnel of 12,500, for naval schools on shore or in harbor, and of the relatively large sum of 30,000,000 francs (£1,120,000) for dirigibles and aviation, this latter departure being the object of favorable comments.

Mons. Monis, with many other patriotic Parliamentary men, has long been of opinion that France ought to utilize her pioneer work in the aeronautical branch of activity, and her superior constructional resources, to organize along her coastline at important strategic points naval aerodromes, with hangars and repairing depots, to be the training centers and points d'appui of dirigible and aeroplane flotillas, at the same time as creating another aerial force for duties with the battle fleet on the high sea. Unfortunately mistrust of the new "craze" on the part of old admirals, who are by tradition opposed to innovations not of naval origin, has prevented any headway being made with the realization of this ambitious program, whilst the mistake was made of entrusting the command of the "aviation maritime" to officers of merit, but having no practical experience in flying. To-day the necessary strong impulse from the Admiralty, together with adequate credits, are forthcoming in support of aerial progress and tangible results have every chance of being obtained at no distant date, at least in what concerns aviation.

The intention is to make Frejus the most important naval aerodrome in existence before the end of the present year, and also to spare no effort to evolve a more satisfactory type of seaplane than the one in service, practical aviators, familiarized with the difficulties of aerial and maritime navigation, being considered as the only experts qualified to decide on the characteristics of the aeroplanes.

A special committee, under Senator Aimond, has been at pains to find out the real price of our most recent ships. The 18,000-ton *Dantons* are shown to cost more than was estimated; namely, 54,788,000 francs (£2,190,000), which is more than the price of the 25,000-ton British *Iron Duke*. Fortunately, regular commands, together with better plant and discipline in the arsenals, have within the last few years rendered French construction considerably more economical, though it will continue to much exceed British rates, the 23,600-ton *Lorraine*, for instance, being estimated to cost 66,000,000 francs (£2,640,000). Yet gradual improvements in this direction may safely be looked for. The new Minister is well alive to the vital importance of cheap and rapid shipbuilding, as is shown by his selection to be

Prefet Maritime at Brest of Admiral Berryer, who displayed competence and energy in charge of the Lorient arsenal.

The forthcoming visit to Brest of the powerful British battle-cruiser squadron of Rear Admiral Beatty elicits much interest in naval circles, and serves to supply a concrete argument of no small force to the partisans of fast fighting ships. The latter point to the irresistible concentration of fire which the three *Lions*, with their 13.5-inch battery and their speed of 28 knots, are in a position to bring against the extremities of the line of any Continental fleet, and urge the importance of France acquiring similar tactical advantages, with the least possible delay. While admiring the capabilities of the British *Lions*, the majority of French naval men, however, consider that such capabilities do not necessarily belong to any battle-cruiser, but are merely the result of the advance gained by the British Ordnance Department, which permits British *Lions* to oppose superior calibers to all contemporary foreign ships. They quote the *Moltkes* as a proof that battle-cruisers may also be of little value.—*Naval and Military Record.*

REPORT ON THE NAVY ESTIMATES. ANARCHY AND INCOHERENCE. CHARACTERISTICS OF NEW MOTHER SHIPS.—Député Maunoury's report on the navy estimates contains an equal share of warm praise for the zeal and professional qualities of the naval personnel and of sharp criticism of the anarchy and incoherence, which still prevail in the various departments of the Admiralty and dockyards, and are, of course, the result of the lack of stability and competence in the direction of the maritime affairs of the Republic. Despite some progress due to the energy of Admiral de Lapeyrère, the French naval machine is far from working smoothly and must be said to remain an inferior instrument when compared with the highly efficient Admiralties of Great Britain and Germany. The various "Directions" of the service continue to be so many water-tight compartments, ignoring each other when not divided by bitter antagonism, and each working on lines of its own to the great detriment of national finance and the efficiency of naval construction. Incredible instances of inefficiency and waste were brought forward in support of these damaging charges, one concerning the battleships *Jean Bart* and *Courbet*, which were delayed through deficiency in their aiming and firing appliances, due to lack of co-operation between constructors and artillerists; another concerning the Diego-Suarez drydock, rendered unserviceable owing to the antagonism between the hydraulic and naval construction departments. Unfortunately blunders of this sort are of almost daily occurrences in the Republican Navy, and, as a rule, no one is held to be responsible for them. So long as firm authority and common sense stability are not enforced at the head of the Rue Royale administration no hope can be entertained of any improvement in this direction. The Republican Navy is essentially an anarchic organization, and herein lies the secret of its incurable weakness and the fact that it is not (as Admiral Bienaimé complained in the Chamber) and cannot be, worth the heavy expenditure it entails, since it lacks the primary elements of efficiency.

After deploring the slow rate of production of the state powder factories, the reporter found reasons for congratulation in the efficient type of heavy armament adopted for our super-dreadnoughts, and especially in the progress realized in what concerns the supply of torpedoes for the fleet, formerly exclusively purchased from Fiume, and now manufactured at the St. Tropez Whitehead-Schneider factory. French naval men, long satisfied with the old type 18-inch torpedo, are getting alive to the vital importance of up-to-date and thoroughly efficient submarine armament. A vigorous effort is being made to give to France the advantage of the long range and heavy caliber torpedoes in use in other navies. Comparative experiments are proceeding, a corps of specialists (ingenieurs-torpilleurs) has been created, and before many years the French Navy will, like the English and the German, be in a position to design and manufacture both her mines and her torpedoes.

The decision of Minister Monis to discard, on considerations of economy, the 12,000-ton battleships *Carnot, Martel,* and *Masséna,* launched from 1893 to 1895, meets with a good deal of justified criticism. Without exaggerating the value of these contemporaries of the British *Majestics,* their heavy guns, combined with their complete belts of great thickness, would enable them to fight with advantage against the small battleships of the Triple Alliance still in commission, most of them armed with inferior calibers. Of the other pre-dreadnoughts, the most recent, the 12,700-ton *Suffren,* is to be transferred from the "Division des Ecoles," considerably reduced in importance, to the reserve division of the battle fleet, which will include the *Suffren* (flagship), *Gaulois, St. Louis, Bouvet,* all with nucleus crews.

The three mother ships to be ordered this year are to be copies of the British *Arethusas,* with a displacement of some 4500 tons, an armament of six 5.5-inch quick-firers, a relatively robust armor belt protection (60 to 90 mm. plates), and a paper speed of 30 knots, which is held to be sufficient to escape from the deadly reach of battle-cruisers, though this is by no means certain. The price per unit is estimated at £560,000, as compared with £760,000 for the 6000-ton type of scout favored by ex-Minister Baudin, and the detailed plans of which have been published in *Le Yacht.* A desire for economy is the only reason for this change of plans, which meets with very moderate enthusiasm, and may yet be reconsidered. Robustness, sea-keeping qualities, together with the aptitude to maintain speed in a seaway and an armament at least equal to that of foreign rivals, ought, in the opinion of French naval men, to be the strong points of Gallic scouts, which unlike the British *Arethusas,* will not be supported at sea by powerful battle-cruisers.—*Naval and Military Record.*

GERMANY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Grosser Kurfurst	26,575	23	10 12-in., 14 5.9-in., 12 3.4 in.	Hamburg	Launched May 5, 1913
Markgraf	26,575	23	same	Bremen	" June 4, 1913
König	26,575	23	same	Wilhelmshaven	" Mar. 1, 1913
Kronprinz	26,575	23	same	Germania	Launched Feb. 21, 1914
Ersatz Worth	.....	....	8 15-in., 16 5.9-in.	Kiel	Laid down Sept., 1913
"T" 1913	29,000	....	same	"	Laid down May, 1913
Cruisers of the Line					
Ersatz Kaiserin Augusta	28,000	30	8 12-in., 14 6-in.	Dantzig	Laid down Sept., 1912
Derfflinger	28,000	28	same	Hamburg (Blohm & Voss)	Launched July 1, 1913
Ersatz Hertha	26,000	....	....	Wilhelmshaven	Laid down July, 1913
Lutzow	28,000	28.5	....	"	Launched Nov. 29, 1913
Protected Cruisers					
Karlsruhe	4,900	28	12 4.1-in., 2 t. t.	Germania	Under trials
Rostock	4,900	28	same	Howaldt	same
Ersatz Irene	4,900	27	10 6-in.	Bremen	Laid down Oct. 24, 1912
" P. Wilhelm	4,900	27	same	Kiel (Kaiserliche)	" " Oct. 23, 1912
Graudenz	4,900	27	....	"	Launched Oct. 25, 1913
Ersatz Hela	4,900	27	....	Kiel	Laid down fall 1913
Ersatz Gefion	4,900	27	....	Stettin	.....

NOTE.—Germany has approximately eleven destroyers and twelve submarines under construction.

"KRONPRINZ."—The fourth and last battleship of the *König* class was launched at the Krupp Germania yard, Kiel, on February 21, where she had been built under the designation of *Ersatz Brandenburg*, and was "named" *Kronprinz*. This vessel was laid down in the summer of 1912, and was on the stocks for a period of 19 or 20 months. She will be placed in commission about June, 1915. Special interest attaches to this launch, owing to the fact that the vessel concerned is the last German battleship to be armed with 12-inch guns. The later ships are to be super-dreadnoughts, with a main battery of 15-inch breech loading. A few characteristics of the class of which the *Kronprinz* is a representative have been made public, but the exact dimensions are not yet available. The displacement is unofficially stated to be 25,500 tons, the designed horse-power 60,000, and the speed 21 knots. Ten 12-inch 50-caliber guns form the primary armament, mounted in five double turrets on the center line, the arrangement of the turrets being almost identical with that of the British *Orion*. On either broadside, therefore, all ten weapons can bear, while the axial fire is from four guns. The standard secondary battery of fourteen 6-inch quick-firers, which has been incorporated in all German battleships since the *Nassaus*, is mounted on the upper deck, a position which should render it feasible to work the guns even in dirty weather. For end-on fire only two of these 6-inch guns are available, as opposed to the four which bear fore and aft in the *Kaiser* class. There are also twelve 3.4-inch quick-firers behind armored shields. Five submerged torpedo tubes are fitted, four on the broadside and one at the stern. The ship will have two funnels, and in general appearance is not expected to differ greatly from the *Kaiser* class, barring the different arrangement of the turrets. Details of protection are naturally withheld, but as the preceding class has a water-line belt 14 inches thick, it is not likely that any reduction in thickness has been made in the new ships.

The *Kronprinz* is the twenty-third German dreadnought to go afloat, and all these vessels have been launched within the last six years. Five others remain on the stocks, three being battleships and two battle-cruisers. Save for the improved disposition of the big-gun turrets, which permits of a wider arc of fire on either beam, the *König* class reveals few points of superiority over the *Kaisers*, the nameship of which class was begun as long ago as 1909. The two classes together comprise nine units. Apart from protection, in which respect they appear to have a decided advantage, these vessels cannot be said to compare very favorably with their foreign contemporaries, though as far as may be judged official German opinion appears to be quite satisfied with the design.

At the launch of the *König* it was widely reported that the ship would receive an armament of 14-inch guns, this armament, in fact, being generally credited to her by the German newspapers, and not until a year later was it authoritatively known that the guns were of the 12-inch type. The revelation caused some heart-burning among the experts, who reproached the Navy Department with having shown too much conservatism towards the introduction of more powerful ordnance into the fleet, thus allowing foreign nations to gain a long lead in gun power. To this charge the official scribes replied by pointing out that the Krupp 50-caliber 12-inch gun was equal in penetration to the British 13.5-inch, while being much handier and faster in action and enjoying a considerably longer "life." This reply would have carried more conviction had it not been almost immediately followed by an announcement that the battleships to be laid down in 1913 would be given 15-inch guns. By independent critics the announcement was regarded as a virtual admission that the much-lauded 12-inch gun was not, after all, equal to modern tactical requirements. However, as the public discussion of such questions is actively discouraged in Germany, the contention of the government newspapers that the *Kaisers* and *Königs* are equal in every particular to foreign ships is rarely contradicted.

The unanimity with which all the papers spoke of a 14-inch armament

in connection with the *König* class and the subsequent disclosure that smaller guns had been adopted plainly hinted at the failure of the first 14-inch weapons manufactured for experimental purposes. On this point Messrs. Krupp and the Navy Department are discreetly silent, but the explanation that the guns did not fulfill the original expectations when they were thoroughly tested would certainly go far to explain the misinformation of the German press regarding the main battery of the ships referred to.—*Naval and Military Record.*

GERMAN AND BRITISH DREADNOUGHTS.—The launch of the German battleship *Kronprinz*, ex-*Ersatz Brandenburg*, raises to twenty-three the number of dreadnoughts built or completing afloat for that power; and although reliable comparisons cannot be based upon the number of ships launched there is a good deal of interest in the fact that the corresponding British total is 34. This includes the *Australia* and *New Zealand;* and if these be excluded, as the First Lord has said they should be when discussing the 60 per cent standard, it will be seen that our superiority of 32 to 23 amounts to only 39 per cent. The present year, however, is likely to see a considerable change in the ratio, for while Germany cannot launch more than her three vessels of the 1913 program—and quite probably will not launch all of those—there should go afloat for the British fleet not only the *Valiant, Barham,* and *Malaya,* the outstanding vessels of the *Queen Elizabeth* class, but also the five *Royal Sovereigns.* Regarding the latter, however, cognizance has to be taken of the fact that it is now the rule for contract-built ships to spend considerably over a year on the stocks. Taking the 1910 and 1911 program, the *Queen Mary* was launched after twelve and the *Ajax* after thirteen months; but in the case of the remaining contract-built ships the period was about eighteen months in each instance. The prevailing labor conditions no doubt had something to do with this; but seeing that none of the contract-built *Royal Sovereigns* was laid down until November—and one not then—it is, perhaps, too optimistic to expect that they will be afloat by the end of the year. On the other hand, contractors as a whole appear to have got over the difficulties which left such a heavy impression on our programs for 1909, 1910 and 1911, and if they are able to get the *Revenge, Ramillies,* and *Resolution* into the water by the end of 1914, we shall then have afloat 42 dreadnoughts (including three Dominion vessels) to Germany's 26. The same figures represent the anticipated completed strength of the navies in 1916.—*Naval and Military Record.*

"ERSATZ VIKTORIA LUISE."—The *Ersatz Viktoria Luise,* to be laid down this year, will be the eighth ship of the battle-cruiser type to be put in hand for the German Navy. By 1917, therefore, there will be a whole squadron of these vessels in commission at Wilhelmshaven. Four of them will be armed with 11-inch and four with 12-inch guns, and the speed of the slowest will be at least 28 knots. With the exception of the *Von der Tann,* which has a 10-inch belt, these ships will be protected by 11-inch to 12-inch armor over vitals. Thus in every respect they are most formidable units. If, as seems probable, the battle-cruiser type is to be dropped in England, the British Navy in 1917 will possess only nine ships of this class (excluding the *Australia*). It is incontestable, however, that in gun power, if not in speed, the British squadron will have the advantage, and this should prove a valuable factor if the battle-cruiser is intended to carry out fast wing tactics in a fleet action.—*Naval and Military Record.*

SOUTH AMERICAN AND AFRICAN CRUISE.—The German battleships *Kaiser* and *König Albert* and the new cruiser *Strasburg* have left Wilhelmshaven for an extended cruise, during which they will visit the German West African colonies and show the flag in South American waters. These ships are being sent forth to advertise to the world the growing naval power of Germany, and incidentally to show the South American Republics that

Germany as well as England can build ships for them. The vessels will return to Europe in March, and a few months later the German naval authorities will be able to congratulate themselves on the completion of the new third squadron, which will give Germany 25 modern and efficient battleships always fully manned and on a war footing. In other words, in ships fully manned and instantly ready at all times the British and German Navies will then be on an equality, unless the fourth squadron of the British home fleets, now based on Gibraltar, is to be withdrawn for permanent service in home waters.—*Naval and Military Record.*

SUBMARINE ORGANIZATION.—On the 7th of February the new system of submarine organization had been in force for twelve months. The torpedo and submarine services were formerly administered by the same department, but the rapid increase in the number of submarines rendered it advisable to separate the two. Although hardly more than six years have elapsed since the German fleet went in for submarines, such quick progress has been made in the last three or four years that there are now nearly thirty boats in commission, and they are being added at the rate of six per annum. Quite recently an "Inspection of Submarines" was created and placed in charge of a flag officer. The new department supervises and controls the exercises of the boats in commission and the submarine training establishment, and also carries out all technical experiments and trials. It comprises three staff officers, 61 lieutenants, 11 subs., 37 engineers, five surgeons, and six paymasters, or 123 officers in all.—*Naval and Military Record.*

SOUTH AMERICAN WARSHIP MARKET. NAVY LEAGUE INFLUENCE. THE PACE IN ARMAMENTS. BRITISH TRAINING SCHEME CRITICISED.—During the week of February 15-20 the new navy estimates have been taking their usual tranquil course through the Reichstag. Here and there a minor item has been vetoed, such as the building of a new officers' casino at Kiel, but there has been no opposition worth the name; in fact, practically all parties have confined their remarks to eulogies of the naval administration. Nothing in the proceedings would have led the casual onlooker to suppose that enormous sums of money were under consideration. Thanks to the unfailing courtesy and good humor of the Secretary of State, Admiral von Tirpitz, who disarms criticism with an engaging smile and deprecatory wave of the hand, the Reichstag finds itself in an indulgent frame of mind on these occasions, and the spokesmen of the various parties vie with one another in offering tributes to the Imperial Marine as a pillar of peace and a symbol of Germany's "Weltmachtstellung." The sole demand around which anything approaching a controversy raged was the appointment of a naval attaché to the South American Republics. Rejected last year, the same demand was put forward again, and this time it has been conceded. Herr von Tirpitz was able to persuade the Reichstag that this appointment was urgent in the interests of German shipbuilding. In the course of the debate the remark was made that the South American warship market has been neglected by Germany in the past, with the result that foreign rivals had carried off most of the orders. The posting of an attaché at Buenos Ayres and the visit of battleships to those waters are a proof of German determination to bid for a larger share of foreign contracts in future.

It speaks volumes for the genius of Admiral von Tirpitz that he has been able to persuade 90 per cent of the Reichstag delegates that the present improvement in Anglo-German relations is entirely due to the growth of the Imperial Navy. Hitherto this somewhat Gilbertian suggestion has been made only by the "armor plate" press, which still contends that real cordiality will never prevail between the two nations until the German fleet is as strong as the British. The remarks of the Minister on the subject of the foreign cruiser squadron it is desired to form are generally construed as a hint of further naval increases at an early date. It cannot be denied that his speech on this point was practically a repetition of all the arguments which have been employed by the Flottenverein in its agitation for more

battle-cruisers. It is easy to see whence the Flottenverein has been drawing its ammunition for this campaign, and once more the world has unmistakable proof of the oft-asserted fact that the German Navy League works hand in hand with the government, and, in all but name, is a department of the German Admiralty. The recognition of this explains why the Navy League's battle-cruiser agitation must be taken very seriously. What the League asks to-day, Admiral von Tirpitz demands to-morrow, and there is absolutely no reason to suppose that the demand for an additional division of giant cruisers will be refused when the time comes to put it forward in a definite shape.

Yet in spite of the general atmosphere of benevolence in which the navy debate is taking place, the Secretary of State has not escaped outside criticism altogether. His speech last week, in which he laid on England the onus of forcing the pace in naval competition and contrasted the "moderation" of German armaments with the aggressiveness of those of certain other countries, is attacked by Capt. Persius, who shows that the Minister omitted figures which would have thrown a totally different light on the situation. Without entering into details of this dispute, it is enough to say that the world has long since drawn its own conclusions in regard to German naval policy, and will scarcely be impressed by these repeated attempts on the part of German statesmen to saddle England with the sole responsibility for the burden of European armaments. They serve a well-understood political purpose, and German writers betray their characteristic lack of a sense of humor when they make these statements in the Reichstag the theme for long-winded homilies on the perfidy of British naval policy.

A stir has been caused by the reproduction of an interview alleged to have been given by Admiral von Rebeur-Paschwitz, commanding the battleships now in South America, to the Brazilian newspaper, *Rio de Janeiro*. In this interview the admiral was made to say that with the Far Eastern division, the Mediterranean division, and the "Detached division," Germany has now three squadrons in foreign waters which will be maintained on their present footing. An official démenti has been issued, to the effect that "official circles" do not believe the admiral ever made any such remark, and it is added that the intention is to disband the "Detached division" as soon as the ships return home. This had been assumed all along. Until the *Kaiser* and the *König Albert* are back from their cruise the high sea fleet lacks two of its best battleships, and there can never have been any intention of allowing these two fine ships to cruise aimlessly about the Atlantic after their mission to South America has been fulfilled.

Rear Admiral Wietschel has written an article on the "naval jack-of-all-trades," in which he comments adversely on the system of training for British officers. He does not consider it possible to make a competent executive or a competent engineer out of the same material, and he apparently thinks the British system is about to break down. "Its success is very doubtful; and if it fails the personnel of the English Navy will be very gravely affected for years to come." This officer congratulates his own service on not having followed the same system. It deserves to be pointed out, however, that nearly every German critic of British sea training lays what we should consider undue stress on the social factor. To put it bluntly, the German view is that engineers must be drawn from a lower social grade than executives in order to facilitate the task of keeping the former "in their places," to use the words of the last commandant of the engineers' school on the North Sea station. There is a fixed belief in the higher ranks of the navy that the middle classes cannot furnish the right material for executive officers. This conviction is also expressed by Capt. von Kühlwetter in his masterly article on the German personnel in the current *Brassey*. Needless to say, it is not shared by the corps of naval engineers or their Parliamentary supporters, but the fact that it exists has given rise to much friction in the past and promises to cause more in future.

On behalf of the engineers the Navy Department is now being urged to create a higher rank for this branch, corresponding to engineer-captain

in the British Navy. The highest present rank is chef-ingenieur (engineer-commander). It remains to be seen whether this concession will be made while the administration of the service remains in the same hands, but the foregoing circumstances have been alluded to for the purpose of showing that the Imperial Navy has a problem of its own to solve, and the German writers who are now complacently prophesying all manner of ills for the British fleet might well pause to ask themselves if all is well with their own.—*Naval and Military Record.*

ESTIMATES OF GERMAN NAVY.—The navy bill contains an increase of 134 in the number of officers, the respective ranks being as follows: 1 vice admiral, 8 captains, 15 commanders, 32 lieutenant commanders, 78 lieutenants and junior officers (Ober Leutenants and Leutenants zur See). Also there will probably be an increase of 48 commissioned engineers in the engineering corps.

There has been an increase of 5000 men in the enlisted personnel, and to this is added 796 men for the mine, torpedo and aviation services.

After the above increases the grand total of the commissioned personnel will be 2612 (including medical officers) and of the enlisted personnel 75,468.

No navy in the world has increased its personnel as rapidly as the German, as the following figures show:

1901-2	31.2	1908-9	50.5
1902-3	33.5	1909-10	53.9
1903-4	35.8	1910-11	57.3
1904-5	38.1	1911-12	60.8
1905-6	40.8	1912-13	66.8
1906-7	43.6	1913-14	73.1
1907-8	46.9		

The budget as published gives the following apportionment:

	Marks
(1) For the high sea fleet in home waters	2,275,000
(2) Station and special duty ships	435,000
(3) Squadron exercises	460,000
(4) "Ships for Special Purposes"	240,000

On the first of April the "High Sea Fleet" will be stationed as follows: First squadron and cruisers in the North Sea; second and third squadrons in the Ostsee (East Sea below Skager Rack and Categat with base at Kiel).

Twelve cruisers, including four battle-cruisers, have been attached to the "High Sea Fleet."

THE "HOHENZOLLERN."—The *Hohenzollern* (the Imperial yacht), now undergoing extensive remodeling in the Vulcan Works, will be equipped as an auxiliary cruiser with a battery of rapid-fire and quick-fire guns. Her new plans call for increased steadiness and a higher speed. The double bottoms will stretch the entire length of the ship. She will be equipped with the Föttinger turbine system; combination oil- and coal-burning boilers; and is expected to make 24 knots.

The number of submarines now building and to be laid down in 1914 is 25. They belong to several types of the following characteristics:

	Displacement above water	Length meters	Beam meters	Draft meters	Speed knots	
10-Clorinde	410	54	5.1	3.3	15	Diesel Engines (Motors)
2-Zedé	797	74	6.0	3.7	20	" " "
3-Q-102	520	60.6	5.4	3.7	17	" " "
8-Q-10	833	75	6.4	3.99	19	Steam (?)
2-Q-107	630	68	5.5	3.75	17	Diesel Motor

—*Mitt. aus dem Geb. des Seew.*—Translated by Lieut. C. B. Mayo, U. S. N.

GERMAN NAVAL CONSTRUCTION FOR FOREIGN COUNTRIES.—*Vulcan Company.*—This firm at its Hamburg works laid down the Greek battle-cruiser *Salamis,* and is building her machinery, including the turbines, of A. E. G. Curtis type. It has launched the German battleship *Grosser Kurfurst,* has under construction a large floating dock, and has built and engined six destroyers for the German Navy and four torpedo-boats for the Greek Navy. At its Stettin works it has laid down the small German cruiser *Ersatz Gefion* of about 5000 tons.

F. Schichau.—At the Dantzig works of this company the German battleship *Ersatz Wörth,* of 28,000 tons, has been laid down, and the German battle-cruiser *Lutzow,* of 27,400 tons, launched. At the Elbing works two 4500-ton cruisers for the Russian Navy, *Mooraviev Amursky* and *Nevelskoy,* have been laid down. Six destroyers have been constructed with their machinery for the German Navy.

Aktien-Ges. Weser, Bremen.—In 1913 this firm launched and is now completing the German battleship *Markgraf,* of 25,500 tons and 34,000 horse-power. This is the first large ship to be fitted with Bergmann turbines, which the Weser Company constructs.

Fried Krupp, Germaniawerft, Kiel.—The Krupp works have launched and completed the German battleship *Prinzregent Luitpold,* of 24,700 tons and 25,000 horse-power—the last of the *Kaiser* class—and have laid down the small cruiser *Ersatz Hela.* They have also laid down four destroyers for the Argentine Navy and completed or commenced a number of submarines for the German, Austrian, and Italian Governments. Guns and armor have been supplied for a number of German warships, also Zoelly turbines, Schulz-Thornycroft water-tube boilers, and the special Krupp type of heavy oil internal combustion motor.

Blohm and Voss, Hamburg.—This firm launched the German battle-cruiser *Derfflinger,* of 25,000 tons and 63,000 horse-power. It has also constructed Parsons' turbines for dockyard-built vessels of the German Navy.

Howalt, Kiel.—This firm in 1913 laid down the new German battleship *T,* of 28,000 tons.

In conclusion, excluding torpedo craft, it may be mentioned that the warship tonnage laid down in private yards in Germany during 1913 was approximately 81,000 tons, as against 54,900 tons laid down in private yards in the previous year. Incidentally, it may be mentioned that the Vulcan Company reported a financial loss on a battleship constructed for the German Navy, and there is some reason to suspect that government contracts represent little or no advantage to German shareholders. The outstanding feature is that, after a many years' practical British monopoly of foreign construction, German private firms during 1913 were at work on one large battle-cruiser, two protected cruisers, four destroyers, and four torpedo-boats for foreign navies, as opposed to a comparatively trifling amount of torpedo-boat work in the previous year. Moreover, Schichau is to all intents and purposes identical with Karl-Zeise of Riga, now doing work for the Russian Admiralty. It is also of interest to note that whereas in 1912 the warships laid down in German Imperial dockyards were confined to one cruiser of about 5000 tons, the displacement of the ships laid down in 1913 amounted to about 33,000 tons, a battle-cruiser being for the first time assigned to the Wilhelmshaven yard. At the same time the Kiel yard was given a small cruiser.—*Naval and Military Record.*

POLICY OF SHOWING THE FLAG IN FOREIGN WATERS. ADVERTISING EFFICIENCY.—On the resumption of the debate in the Reichstag on the naval estimates, Herr Bassermann, on behalf of the National Liberals, said that Admiral von Tirpitz had declared that a naval holiday for a year was unrealizable for Germany. "We hold fast," he added, "to our building program, and will not allow it to be disturbed. The idea is gaining ground in England that our fleet has no aggressive character, and our relations with England have improved, but an alliance with England much remain, so far as can be foreseen, a beautiful dream." He approved the despatch of Ger-

man warships to foreign waters. The appearance of their ships in the Mediterranean was the best advertisement of German efficiency. He concluded with a warm encomium on the naval policy and naval administration of Admiral von Tirpitz.

Herr Nehber (conservative) expressed satisfaction that Admiral von Tirpitz had neither added to nor subtracted from his declarations on the disarmament question in 1912, and declared that the conservatives had not thought of an alliance with England. He pleaded for stronger representation of the German Navy in foreign waters.

Showing the Flag.—Admiral von Tirpitz said he welcomed the suggestions of the previous speakers that the fleet in future should be more strongly represented abroad.

The economic and political utility of the appearances of our ships in foreign waters (he declared) must be rated very high, but stronger naval representation abroad is not only a political and economic necessity, but is also a military necessity. All navies must keep in close touch with distant seas and conditions abroad. In recent years we have not done this to the extent which we ourselves would have wished. That has been due to circumstances which I need not explain in greater detail, to the concentration of our fleet in home waters. It is not a question now of creating a special Mediterranean division, but of increasing the activity of our fleet abroad in general. Unfortunately we have not yet nearly reached the number of ships which, according to the navy law, should be serving in foreign waters, a fact which has lately been felt in an especially disagreeable manner. Last year part of our East Asiatic squadron was urgently needed in the South Seas, but ships had to be recalled on their way thither because they were more urgently needed in China. It was equally unsatisfactory that we had to detach a ship from the East Asiatic squadron for Western American waters. Our need in the Far East itself is not fully met. The cruiser *Bremen*, with the support of the Hamburg-American Line, has done good service, but one ship is not enough. We were obliged to land cadets and ships boys armed with rifles in Haiti to protect German subjects. It is not right to use training ships for such purposes, however much the cadets and boys have enjoyed it. The House may perceive from these examples how heavily we have felt the necessity for a stronger representation abroad during the past few years, and it will indubitably be the aim of the next few years to reach, within the limits of the navy law, as soon as possible the number of ships assigned by the navy law for foreign service. The spokesmen of all the non-Socialist parties have pointed out that the carrying into effect of our navy law is a national necessity. I, too, cherish the firm and full conviction that the whole German people realizes the political necessity of giving effect to the existing navy law.

Limitation Impracticable.—Herr Heckscher (radical) concurred with the political and economic utility of showing the flag abroad. He agree with the Socialists that on the disarmament basis an international agreement was conceivable, but Great Britain and Germany could not conclude such an agreement without the co-operation of France and Russia. Moreover, a naval holiday would be disastrous for the workers in German shipyards.

Herr Wermuth (Imperial party) expressed himself against the imposition of any limitations on German naval policy.

Herr Vogtherr (Socialist) declared that his party was against any extension or acceleration of the navy law. Mr. Churchill's suggestion of a year's holiday for shipbuilding, he declared, deserved to be taken seriously.

After a final reply from Admiral von Tirpitz, the vote for the salary of the Secretary of State was passed.—*Naval and Military Record.*

GERMAN POLICY RESPECTING INTERNAL COMBUSTION ENGINES.—Herr von Tirpitz also dealt with the internal combustion engine and its application to warships, and expressed his confidence that the new system of propulsion will have a great influence on future naval design. From the

very condensed report of his speech, however, it does not appear that his department proposes to lay down any large Diesel-driven ship at the present stage. It is Germany's traditional policy to let other nations take the lead where naval innovations are concerned, and to learn from their dearly bought experience before doing anything herself. This was the policy followed in the case of the water-tube boiler, the steam turbine, and the submarine boat, none of which were adopted by the German fleet until they had been exhaustively tested and more or less perfected by foreign navies. This method is undoubtedly economical and is well suited to a nation which is determined to get full value for the money it devotes to its fleet, but some critics on this side consider it has been pushed too far. On the other hand, information relating to technical matters in connection with the navy is so meagre that it would be premature to conclude that Germany has done nothing to develop the oil-fired marine boiler. A few, at least, of the later torpedo craft are understood to have several, if not all, of their boilers fitted to burn liquid fuel, and similar reports have been heard regarding the *Goeben* and the *Seydlitz*. That oil is expected to be in great demand in the near future is proved by the erection of huge tanks at all the German war harbors.—*Naval and Military Record.*

GERMAN PROGRESS IN TORPEDO WARFARE.—People who are in a position to know assure us that progress in gunnery has been equalled, yes, and surpassed, by the corresponding progress in torpedo training across the North Sea. Needless to say, the actual extent of this progress is not advertised by the Wilhelmstrasse. Until recently torpedo running was confined almost entirely to the range at Friedrichsort, near Kiel, but quite lately a new range was opened at Eckernförde to give full play to the longer range of modern torpedoes. At Friedrichsort is situated the Imperial Torpedo Factory, where 90 per cent of all these weapons used in the navy are made. It is the prudent policy of Germany to confine the output of torpedoes for service use to state-controlled shops, as far as possible, to facilitate the retention of secrets. In former years the firm of Schwartzkopff, of Berlin, and the Whitehead factory in Hungary found Germany a good customer, but of late she has preferred to make her own torpedoes. Thus, whenever a torpedo embodying any improvement is completed, it leaves the state factory to be tested on the range, only a few yards away. This arrangement makes it impossible for any unauthorized observer to gather information of new developments, and only very occasionally do authentic details percolate through.

According to the semi-official works of reference issued in Germany, the latest ships, including all the dreadnought battleships and cruisers, the latest light cruisers, and all destroyers from and including those of 1909, are armed with 50-cm. torpedoes. Now, there is strong reason to believe this to be a misprint or a "terminological inexactitude," and the actual diameter of the new torpedo to be 55 cm., or 21.6 inches. This weapon is understood to be some 17 feet long, to carry a bursting charge of 290 pounds, and to have a range of about 7500 yards. Although the highest speed is behind the published velocity of foreign torpedoes of equal or later date, the extremely powerful warhead is held to be more important. A number of tests carried out against specially constructed targets demonstrated that the 18-inch torpedo was not destructive enough to ensure that a single hit would disable a modern capital ship. It was therefore decided to concentrate on the problem of giving the torpedo the maximum destructive potentiality, while keeping speed within reasonable limits. Moreover, there was substituted for the usual charge of guncotton a warhead of T. N. T. (Trinitrotoluene), which is the more powerful explosive of the two. One hit from the new 21-inch torpedo would, it is believed, place even a 27,000-ton battleship on the "sick list," no matter on what part of the hull it got home.

The whole system of torpedo training in the German Navy aims at the perfection of assaults delivered under cover of darkness or of correspond-

ingly favorable weather conditions. Daylight tactics are considered impracticable, and when these are adopted at maneuvers they are merely intended as a spectacle for the edification of guests on the flagship. Massed attack is also favored to the extent that boats should act collectively, and as a rough rule it is estimated that at least four boats must be used against each object ship simultaneously if the attempt is to be successful. If, therefore, a hostile squadron of eight battleships was to be assailed, at least three flotillas, *i. e.*, thirty-three boats, would undertake the attack. It is understood that this plan is followed with more or less regularity in German torpedo exercises.

Another feature is the high speed at which night attacks are made. Until some three or four years ago German torpedo-boats rarely maneuvered with masked lights. Since that time, however, the procedure has been changed, and now exercises with masked lights are the rule rather than the exception. There is no denying the superb efficiency of the German torpedo service as displayed in training under these circumstances. A flotilla working at night moves with an assured precision that is nothing short of marvellous. Although no light is shown beyond a mere glimmer at the stern to indicate changes of speed, etc., the boats rush along at top speed in the closest formation, and the flotilla commander exercises the most perfect control over his flock. The most eloquent testimony to this efficiency is furnished by the rarity of accidents, in spite of the fact that the German flotillas claim to put in more actual sea work than the destroyers of any other nation, not excepting Great Britain. The boats are built to stand knocking about, but they are not remarkably comfortable. Everything has been subordinated in the construction to speed and weatherliness, but personal inconvenience does not appear to affect the enthusiasm of officers or men. They have enormous confidence in their boats and in themselves. They claim that the fine flower of the naval personnel, officers and men, is to be found in the flotillas, and anyone with first-hand knowledge of the matter will agree that there is something in the claim. Men and boats are always in the best of condition, ready to go anywhere and do anything.

Most authorities accept it as a foregone conclusion that the torpedo flotillas will play a decisive part in the next naval campaign in which the Fatherland is engaged and any naval power which stands in expectation of imminent trouble with Germany will, if the trouble materializes, doubtless emerge with painful experience as to the efficacy of the torpedo when rightly used.—*Naval and Military Record.*

GERMAN NAVAL POLICY.—*Minister's Case Against a Holiday.*—From the official report of the proceedings of the Budget Commission of the Reichstag, it appears that the Secretary of State for the navy, in the course of his speech, said German naval policy had never assumed aggressive aims in regard to Great Britain, but had aimed at attaining a measure of naval power commanding respect. Turning to the organization of the two fleets, he said Germany with her five squadrons of battleships, setting the life of the ships at twenty years, must replace them at an average rate of two yearly, and they did not intend to do more. Great Britain, for her eight squadrons, must lay down an average of three ships annually, but for the last five years she had been building at the rate of five battleships yearly, which was a very long way from the ratio of 16 to 10. In these conditions, if it was desired to reach an armament agreement, it was only natural that Great Britain, being by far the greatest naval power in the world, should make definite proposals.

In regard to the suggested holiday in naval construction, he said "that means either that the program for one year should be postponed, in which case the omission would have to be made good in the following year, or that the holiday-year program should be permanently dropped. In the former case our finances, the labor conditions in our shipyards, as well as our military conditions, especially the regular commissioning of completed

vessels, would fall into disorder. Still further difficulties would be involved for us. Great Britain's shipyards are filled to overflowing with new ships, while our building activity is meager. We should have large dismissals of workmen, and the whole arrangements of our shipyards would be upset. If the holiday-year ships are to be abandoned, there would be a shortage in the legally established organization of our fleet, as we only build ships to replace others."

Replying to various speakers, Admiral von Tirpitz expressed the firm conviction that without a navy Germany would probably never have reached good relations with Great Britain. She must, he declared, inevitably have sunk to the level of a vassal state. In conclusion, he expressed the view that overmuch attention should not be paid to reports in the press, especially in the British press, with regard to the projected reduction in the displacement of capital ships. They had always found, he said, that such statements turned out to be incorrect. He could only repeat that Germany had never forced the pace, and that he would welcome a general reduction in displacements.—*Naval and Military Record.*

The German navy estimates are still the index to the naval movement throughout the world, and the figures for the new financial year, though not sensational, are full of interest. The aggregate sum to be devoted to the fleet is larger than the maximum voted this year by £400,000. On the other hand, the ordinary estimates, that is, those that are to be covered by revenue rather than loan, are £1,400,000 higher. As the value of the fleet increases so, under the automatic rule which applies to the raising of loans, the amount of money spent on new construction is taken in larger proportions from revenue, and the time is not far distant when the loan policy for shipbuilding will come to an end. Under the scheme of finance which was incorporated in the naval legislation, the German people are being provided with a far larger navy than they are paying for by cash, and since the pressure of taxation is very high, they have regarded this method of postponing the day of payment with lively satisfaction. Indeed, but for this policy of loans, it is doubtful whether the Imperial Government would have succeeded in so rapidly educating public opinion on the naval issue. Under this financial scheme it has been possible to keep down the charges on the taxpayers of the present generation by casting the burden of paying for the ships in part on future generations. Not only has this been done, but even the interest on loans and the annuities in repayment of loans do not appear in the navy estimates.

The result of this method of finance has been to lighten the burden on the taxpayer very appreciably, as the following figures, representing the amount met from loan from year to year indicate, the sums being given in million pounds sterling:

Year	£	Year	£
1901-2	2.7	1908-9	4.2
1902-3	2.5	1909-10	5.4
1903-4	2.3	1910-11	5.5
1904-5	2.3	1911-12	5.3
1905-6	2.3	1912-13	4.0
1906-7	2.5	1913-14	2.5
1907-8	2.8		

In 1909, 1910, and 1911, that is during the three first years of the running of the amending act of 1908, half the sum spent upon naval construction and armament was raised by loan, and thus the present generation of Germans could view with extreme satisfaction the rapid addition of ships to the fleet, since they were getting them at half-price, leaving succeeding generations to pay the remainder of the bill. During the period which has elapsed since the beginning of this century loans for the navy have been

raised to the amount of, roughly, £44,000,000. Not only is the present generation not finding this money, but the interest on the loans and the annuities for the repayment of these loans do not appear in the navy estimates in any form, and consequently the actual expenditure of Germany is far higher than appears in the estimates.—*Naval and Military Record.*

ACTIVITY OF THE NAVAL SERVICE.—A despatch from Kiel to the official *North German Gazette* throws a vivid light on the activity of the naval service in the past year. The vessels in full commission at one or other period during the year included 25 battleships, 14 armored and 23 small cruisers, 11 gunboats, 7 training ships, and 11 special ships, or 91 ships in all, exclusive of torpedo craft. The present year will witness many changes in the foreign squadrons, as a number of older ships are to be replaced by new ones. As regards torpedo craft, no fewer than 194 boats were in service, some of them being placed in and out of commission four or five times in the 12 months. Ten of the boats were commissioned as division boats, and 27 for mine-sweeping duties. Modern material in active service was represented by 93 Schichau, 33 Vulkan, and 31 Germania destroyers. These figures are eloquent of the ceaseless activity of German torpedo training.

The *Gazette* states that both the matériel and the personnel of the torpedo branch are subjected to heavier strains each year, and remarks that only in this way is it possible to raise the efficiency of German torpedo-boats to that standard which they have now reached, and which must be maintained. The number of submarines steadily increases. Last year there were 24 of these boats kept in commission, six of them having joined during the year. As a rule, says the *Gazette,* very little is heard as to the movements of the submarines, " for in this branch the navy is doing its work without desiring publicity."

The two new cruisers *Karlsruhe* and *Rostock* have practically completed their trials, and will shortly be assigned to service, the former on the America station, where it will relieve the *Bremen,* and the latter in the scouting squadron of the high sea fleet. In appearance these ships are identical with the *Breslau* class, though they are somewhat larger. Improved protection is given by the wider armor belt, which is also believed to be slightly thicker than the 4-inch belt of the *Breslau* class. The excellent protection of all these newer German light cruisers deserves to be noticed, in view of the publication of details of the British "light armored cruisers." Over vitals the *Breslau* has 4-inch vertical armor, reinforced by a 2-inch deck on slopes, associated with very wide coal bunkers. This combination should afford effective protection from the attack of high-velocity 6-inch shell, and at long ranges might well resist still heavier projectiles. The thickness of the armor, if any, above the belt is unknown. It is clear that these cruisers have nothing to fear from the guns of contemporaries in the same class as far as injuries to vitals are concerned, but the same can scarcely be said of the *Arethusa* and *Calliope,* which have only 3-inch unbacked armor on the water-line and a half-inch deck behind it. Being fired by oil only, they have no bunker protection. It is doubtful if this armor would be of much avail even against 4-inch shell; it certainly could not resist anything heavier. In armament the ships are about equal, the advantage, if any, falling to the British ship with its 6-inch quick-firer fore and aft. As regards speed, the *Arethusa,* if she succeeds on trial, will be some two knots faster than the *Breslau* and about one knot in advance of the *Karlsruhe,* which is reported to have made 29 knots. It remains to be seen what account the *Arethusas* will give of themselves when they are in service, but the opinion is expressed in shipbuilding circles on this side that the design attempts far too much on the displacement.—*Naval and Military Record.*

WAR UTTERANCES BY ADMIRAL BREUSING. GREAT SEA FIGHT FORECASTED. REMARKABLE ALLEGATIONS. BRITISH AND GERMAN RATES OF SHIPBUILDING. —The extraordinary speech made by retired German flag officer, Admiral

Breusing, at a meeting of the Navy League held in Wiesbaden some time ago, is still the subject of comment. A large number of newspapers, especially those which enjoy service patronage, warmly endorse the admiral's remarks as the utterances of a candid and courageous German sailor, while in other quarters the speech is severely criticised as unseemly and provocative. Admiral Breusing has since repeated it at several other meetings, and appears to have had a rousing reception everywhere. As this officer is admitted to be one of the most influential speakers on behalf of the Navy League, the following report of his lecture, translated verbatim from *The Wiesbadener Zeitung,* may be of interest:

"The speaker began by sketching the history of the German fleet from the accession of the Emperor to the present day, and gave an appreciation of the services rendered by the Emperor himself and his naval paladins, Grand-Admirals von Tirpitz and von Koester. By means of the navy law the German fleet first became valuable. The broadening of the Kaiser Wilhelm Canal, which will shortly be completed, doubles the value of the ships, for it enables the very largest vessels to pass from one sea to the other very rapidly. We now possess in our submarines a real high-sea weapon, which has proved its efficiency by long endurance cruises. The modern view is that the most effective fleet formation is that of 25 battleships and eight cruisers, for an enemy attacking such a fleet would have to divide his forces and thus weaken himself. Unfortunately this number will not be available before 1920. The Churchill "holiday year" was emphatically repudiated by the speaker as an utterly insincere and dishonorable proposal (einen durchaus unaufrichtigen und unehrlichen Vorschlag). The growth of the fleet on the basis of the navy law has coincided with the extension of our dockyards, coast defences, and harbors. The Imperial yard at Wilhelmshaven is now the largest and best in the world. Heligoland, for which perhaps we had to give much, but which nevertheless we had to have at any cost, has been made impregnable and transformed into a secure naval base. The mouths of the rivers are protected against surprise attack by batteries ready to open fire at any moment, and by mine fields, and a watch is maintained there as in war. The military training is of a higher standard than in any other navy, and our tactical exercises are now copied by every other nation, including England. In the Russo-Japanese War the Japanese adopted our tactical formations, which they had discovered by some unexplained means, and accordingly defeated the Russians.

"The speaker then turned to the tasks of the fleet, and declared point blank that we are threatened with a world war by France. A country which, although much inferior in population, keeps up a far bigger army than ours and has gone back to the three years service, is not doing this for parade purposes. France believes that what is perhaps the last moment for a war of vengeance has arrived. In 1903, 1905, and 1911 England invited France to attack Germany, and promised her military aid. On two occasions France ignored the invitation because she felt herself too weak. In 1911, however, she was ready, but she demanded from England the landing of 150,000 troops in Belgium, in a certain sense as a pledge that England would not, as she has so often done, conclude peace on her own account and leave her ally in the lurch. But the English Admiralty dared not sanction the expedition in view of the menace to the transports from the German fleet. So accordingly this Board of Admiralty was dismissed, and the unquiet Churchill was promoted to the highest naval position, while a Hessian Prince, Prince Louis of Battenburg, declared himself ready to convoy these transports destined to ruin Germany.

"Previous to 1900 the English plan was simply to steam into the German rivers on the outbreak of war, but they had to give this up when the rivers were fortified. They then resolved to seal up the North Sea; but this scheme, too, had to be set aside when the commanding officer in Egypt claimed a part of the necessary force to serve in the Mediterranean. It was then planned to attack the German coast from the Ems, but this was made

impossible by the fortification of Borkum. So the English have had to fall back on the plan of a limited blockade of the German coast and an extensive use of mines. It is this mine-laying work that will certainly bring about the first encounters with submarines and torpedo-boats, and the guns of Helgoland may then have a chance of intervening. Our cruisers will attempt to gain the Atlantic, where they will cut up the English food supply, this being of the greatest importance in view of England's insular situation. After some time there will come the decisive action between the two fleets, in which as many as possible of the enemy's ships must be destroyed. After this battle we shall be able to rebuild our fleet more quickly than England, thanks to our larger number of skilled artisans and laborers in general. The decisive engagement will begin at 10,000 to 12,000 meters, which range it will be the German tactics to maintain as long as possible. At 7000 meters the torpedo will come into action, and later on the fight will degenerate into a mêlée of the wildest description, ship fighting ship, and using every method of destruction. The German fleet will probably enter into this close action already possessing an advantage, due mainly to its excellent Krupp gun material, which England simply cannot equal. Whoever wins in this struggle, it is certain that the defeated side will leave all its ships and men at the bottom of the sea, while the victors will return home a ruined fleet.

"At this stage of the war our allies will come to our support, especially Italy, which owed the failure of its claim to Tunis to English intrigues, and was also to be betrayed out of Tripoli. While the Italians were fighting in Tripoli, England and France were negotiating with Turkey for the lease of this territory, in which case it would, of course, have been lost to Italy. Hence Italy's sudden declaration of annexation, before she had gained more than a few harbors. Italy has not forgotten, nor will she forget. She is in a position to march from Tripoli along the two-thousand year old and twenty meters broad Roman road into the heart of Egypt, to seize the Suez Canal, and thus to deal a mortal blow at the British world position. All this makes England very careful, the more so because Japan is obviously arming against her. During their alliance with England the Japanese also have found out what England's allies invariably do find out, namely, that England reaps all the advantage and leaves the burdens and the cost to others. For this reason Churchill says that English naval policy must be reorganized by 1916, for by that time Japan will have her ships ready. For this reason, too, she attempts to make friends with Germany. Well-informed persons had told the speaker that these negotiations demanded the renunciation of many German claims. There is, however, said Admiral Breusing, no ground for such a renunciation. We hold the trumps in our hand, and provided we show England the cold shoulder we can get from her whatever we want."

The following note by Captain Persius appears in a Berlin newspaper:

"The Nationalistic press has recently been printing the most contradictory statements regarding the time required to build English and German battleships respectively. Whenever they wish to prove that England is no longer able to continue the armaments race they declare that our yards build as fast, nay, faster, than the English. But when they want to convince us that our navy is far behind the British in strength, they say the English build much more quickly than we do. What are the facts? *Nauticus* gives the following authentic figures for our latest battleships: The *Kaiserin* was laid down in November, 1910, and commissioned for trials on May 10, 1913. The *König Albert* was laid down at Kiel in July, 1910, and was completed in the summer of 1913. The *Prinzregent Luitpold* was begun in June, 1911, and began her trials in summer 1913. The *Marine Rundschau* for July 1913, reports the *König Albert* as having run her acceptance trial on June 20, and the *Prinzregent Luitpold* on June 14. According to these details the *Kaiserin* took 30 months to build, the *König Albert* 36, and the *Prinzregent Luitpold* 30 months. A table in *The Naval and Military Record* gives the corresponding dates of recently completed

British battleships: *Centurion*, 28 months; *Audacious*, 31 months; *Ajax*, 32 months, and *Queen Mary*, 30 months. The first 29 British dreadnoughts averaged 26.97 months. The last were delayed by strikes and other causes. The truth is, therefore, that British yards now build only a little faster than the German."

On January 7 the German cruiser *Breslau* arrived at Trieste, and entered the dockyard at San Marco, where she will undergo repairs and a general overhaul lasting several weeks. This is the second time within the last few months that a German warship has been repaired at an Austrian yard. Last autumn the *Goeben* was in dockyard hands at the Imperial arsenal at Pola. These visits are held to confirm the existence of a naval agreement between Germany and Austria-Hungary, which is responsible for the creation of a German Mediterranean cruiser squadron.

In the course of the navy debate in the Reichstag on January 20, Admiral von Tirpitz ostentatiously took the Navy League under his wing. Several Social-Democratic speakers had previously attacked the League, alleging it to be one of the principal sources of ill-will between Germany and England by reason of its violently anti-English campaign. In reply, the Secretary of State said: "I must defend the Navy League against such attacks. Naturally it agitates on behalf of the fleet, that being its aim and conviction." Too much significance need not be read into this remark, but on the other hand it may fairly be taken as an admission that the means employed by the League to further its campaign are not found fault with by the government. Of course, this will be no news to anyone who has taken the trouble to probe beneath the surface of the naval agitation in Germany. Between the Navy Department and the executive of the League the most intimate relations have always existed, and Germans have good reason to congratulate their country on the wonderful results of this harmonious co-operation. At the same time, one cannot forget how invariably the Navy League writers and speakers revile England, nor how the whole policy of the League has been, and continues to be, the creation of national feeling against England in order to accelerate and justify the expansion of the German fleet.

The latest reminder of this is to be found in the speeches of a German flag officer, Admiral Breusing, whose burning indictment of perfidious England delivered at Wiesbaden lately appeared in these columns. Incidentally, this officer repeated his speech, with some additions, at a Pan-German meeting held in the Reichstag building at Berlin on February 11, and was again received, to quote the newspapers, with "tumultuous and long-continued applause." The Secretary of State for the navy cannot be unaware of the questionable methods employed by the Navy League. At all events, he is, as he declared in the Reichstag, ready to defend it, and this establishes a sort of relationship between the government and those speakers who go about the country vilifying England. It should not escape notice that although Admiral Breusing and other no less fiery colleagues have been lecturing and writing in the same inflammatory strain for many months, not a single newspaper of official standing has seen fit to utter a word of remonstrance. Hence public opinion cannot be blamed for concluding that these repeated attacks on England meet with the tacit approval of the Imperial Government, and Admiral von Tirpitz's allusion in the Reichstag cannot be said to have removed that impression.—*Naval and Military Record.*

GREAT BRITAIN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Benbow	25,000	22	10 13.5-in., 16 6-in.	Beardmore	Launched Dec. 12, 1913
Emperor of India	25,000	22	same	Vickers	" Oct. 27, 1913
Iron Duke	28,000	22	same	Portsmouth	Under trials
Marlborough	25,000	22	same	Devonport	Launched Oct. 24, 1912
Qu'n Eliz'b'h	27,500	25	8 15-in., 16 6-in.	Portsmouth	" Oct. 16, 1913
Warspite	27,500	25	same	Devonport	" Nov. 26, 1913
Valiant	27,500	25	same	Fairfield	" Dec., 1913
Malaya	27,500	25	same	Walker	Laid down Oct. 20, 1913
Barham	27,500	25	same	Brown & Co.	Launched Feb., 1914
Roy'l Sover'gn	25,500	21	.....	Portsmouth	
Royal Oak	25,500	21	.....	Devonport	
Resolution	25,500	21	.....	Palmer	
Ramillies	25,500	21	.....	Beardmore	
Revenge	25,500	21	.....	Vickers	
Battle Cruisers					
Tiger	30,000	30	8 13.5-in., 12 6-in.	Brown & Co.	Launched Dec. 15, 1913
Light Cruisers					
Brisbane	5,490	25	9 6-in., 4 3-pdrs.	Sydney	Laid down Jan. 25, 1913
Birmingham	5,530	....	.....	Elswick	Trials begun Nov. 22, 1913
Lowestoft	5,530	....	.....	Chatham	Launched April 23, 1913
Nottingham	5,530	....	.....	Pembroke	" April 18, 1913
Aurora	3,600	....	.....	Devonport	" Sept. 30, 1913
Arethusa	3,600	....	.....	Chatham	" Oct. 25, 1913
Penelope	3,600	....	.....	Barrow	Laid down Feb. 1, 1913
Phaeton	3,600	....	.....	"	" March 12, 1913
Royalist	3,600	....	.....	Dalmuir	" March, 1913
Galatea	3,600	....	.....	"	" Jan. 9, 1913
Inconstant	3,600	....	.....	"	" March, 1913
Undaunted	3,600	....	.....	Govan	" Dec. 21, 1912
Cleopatra	4,400	....	.....	Devonport	.....
Calliope	4,400	....	.....	Chatham	.....
Conquest	4,400	....	.....	"	.....
Cordelia	4,400	....	.....	Pembroke	Laid down July 21, 1913
Carysfort	4,400	....	.....	"	.....
Cornus	4,400	....	.....	Wallsend	.....
Caroline	4,400	....	.....	Birkenhead	.....
Champion	4,400	....	.....	Hebburn	.....

NOTE.—England has approximately 34 destroyers and 24 submarines under construction.

THE NEW "ROYAL SOVEREIGNS."—We learn on excellent authority that the majority of the stories that have been in circulation as to the characteristics of the battleships of the *Royal Sovereign* class of this year's program are inaccurate. It has already been shown that the reported armament of ten 15-inch guns was inconsistent with a displacement 2000 tons less than that of the ships of the *Queen Elizabeth* class. As a matter of fact, the *Royal Sovereigns* will be practically sister ships to the *Iron Dukes*, the only notable point of difference being a reduction of the nominal speed to 21 knots and a slight corresponding increase in the thickness of armor. It is probable that the great bulk of naval opinion will welcome the decision of the Admiralty not to proceed further with the mounting of the 15-inch gun, although the question will naturally arise as to the position that will be occupied in our naval economy by the *Queen Elizabeths*, with their three unique qualities of "all oil" furnaces, a speed intermediate between that of battleships and of battle-cruisers, and 15-inch guns. It is worthy of remark that although the 12-inch gun held its position in our battleship armaments for twelve or fourteen years—from the

Majestics to the *Hercules*—no fewer than four types of primary guns were included in the four programs of 1909-10, 1910-11, 1911-12, and 1912-13. The 12-inch weapons of the *Hercules* and *Colossus* were succeeded by the 13.5-inch of the *Orion* class; then came the improved 13.5-inch as mounted in the *King George V* and *Iron Duke* classes, and finally the 15-inch of the *Queen Elizabeths*. For many reasons it is to be hoped that a settled policy will be followed in this matter, at any rate for a few years.—*Naval and Military Record.*

PUNISHING POWER OF THE "WARSPITE."—The new battleship *Warspite* will, when completed, have a punishing power unequalled by any other ship afloat. The warships coming nearest to the great British ship will be the United States battleship *New York* and the *Rio de Janeiro*, while the German battleships of the 1912 program will be much inferior in weight of broadside, estimated by experts to reach as far down as 80 per cent. The 25-knot speed of ships of the *Warspite* group will make them of the greatest strategical as well as tactical use to naval commanders during a war, for a fast squadron of such formidable fighters will give the side to which they are attached a great advantage in nearly all conceivable circumstances. The 6-inch guns forming their secondary batteries will be placed in highly protected turrets, and not mounted in batteries behind armored superstructures as in the *Iron Duke* type. There was a great outcry a short time back about the *Empress of India* experiments having been useless owing to the vessel sinking before she could be got into harbor and thoroughly examined. We pointed out at the time that this conclusion was premature, and that a great deal of information had, as a matter of fact, been gained by visits paid by gunnery experts to the ships between the series of attacks. As a result of these experiments we now see the 6-inch guns of the *Warspite* placed in turrets, as it was found that the 6-inch guns from one of the *Town* class of cruiser engaged in the attack on the old *Empress*, played such havoc with her superstructure that it would have been impossible for men to have fought a secondary battery behind it. This result only confirmed the experience of the Japanese in the Sea of Japan, where the Russian crews were thoroughly demoralized by the fire from Admiral Togo's secondary guns.—*United Service Gazette.*

WARSHIPS TO BE SOLD.—The Admiralty has ordered seven warships to be placed on the sale list, as no longer fit for service. They are the battleships *Hood, Resolution*, and *Revenge*, all of the *Royal Sovereign* class. The other four are the light cruisers *Cambrian, Æolus, Forte*, and *Scylla*. Other vessels on the sale list are the light cruisers *Flora* and *Barham*, the destroyers *Otter, Whiting, Virago, Taku, Foam, Janus*, and *Hardy*. The battleship *Renown*, the light cruiser *Colleen*, and the famous old training ship *Britannia* are also to go.—*Engineer.*

THE "INVINCIBLE."—The battle-cruiser *Invincible*, on whose refit at Portsmouth £114,000 is being expended, has had her eight barbette guns landed in order that the gun mountings may be adapted for hydraulic control from the electric control with which they have been hitherto fitted. The *Invincible* is the first large ship in the British Navy whose guns were supplied with electric control apparatus, and as an experiment two different systems were fitted to the four barbettes, in which eight 12-inch guns are mounted. It is stated that neither system has come up to expectations, and for that reason the Admiralty have decided to replace them with hydraulic gear similar to that which has proved so satisfactory on the other ships of the class.—*United Service Gazette.*

SANER SIZE OF BATTLESHIPS.—It seems almost too good to be true, and yet it appears to be an undoubted fact, that the *Royal Sovereign* group of battleships, whose keels are now being laid down at our royal dockyards

and private shipbuilding yards, are to be as much as 2000 tons less displacement than the *Warrior* class. Our readers will know that the *United Service Gazette* has always been strenuously on the side of capital ships of medium size, as against the huge and cumbrous leviathans of the super-dreadnought type, where such a large part of our sea power, and so many precious lives of expensively trained men, are placed over one keel. But the gunnery experts who have prevailed at the Admiralty during the last decade have had their way, and we have leapt up by thousands of tons in the size of each new group of capital ships, until the *Warrior*, of 28,000 tons displacement, has been reached, and still the experts call for more tons and more guns to be placed in each naval basket which is placed on the stocks. They have now received a check, apparently, in the design of the *Royal Sovereigns*, and it is to be hoped that the check is something more than a temporary one, otherwise our navy estimates must go up by leaps and bounds again if each year's expenses are to be provided out of its own revenues, and loans are not to be resorted to, for large sums will have to be annually expended on naval works. It is not only locks and docks, wharves and channels, which will have to be enlarged to meet new requirements, but some of our old naval harbors are being made obsolescent by the ever-increasing size of the battleships, and new harbors will have to be found if we continue at the present rate of increasing displacement, and then the expense will be enormous, even for so rich a country as our own.—*United Service Gazette.*

Nottingham, light cruiser, Capt. C. B. Miller, has completed her high speed and other trials in the Clyde, and left for Pembroke to complete fitting out. The speed tests, including those over the measured mile off Skelmorlie, were reported to have been very satisfactory.—*Army and Navy Gazette.*

"LINNET."—Yarrow & Co., Limited, have delivered to the Admiralty the *Linnet*, which is the second of the *L* class destroyers being built by them. She is fitted with the makers' latest type of superheater and feed heater, and a considerable economy of fuel is obtained.—*Engineer.*

"LYNX."—H. M. S. *Lynx*, one of three torpedo-boat destroyers being built at present by the London and Glasgow Engineering and Iron Shipbuilding Co., Ltd., for the British Navy, left the builders' basin at Govan on January 20 for drydocking at Greenock, and on the 22d she proceeded on her final acceptance trial, which proved to be very successful; the ship subsequently departed for Portsmouth to commission. The dimensions of the *Lynx* are: 260 feet in length between perpendiculars by 27 feet in breadth. She is fitted with Parsons' turbines developing over 25,000 shaft horse-power, and has water-tube oil-fired boilers of the Yarrow type constructed by the London and Glasgow Co. She attained a very high speed when running her full-power trials.

The second of the destroyers, built by the London and Glasgow Co., the *Midge*, which recently completed her program of steam trials with satisfactory results, establishing a speed record for her class, will be delivered in February.—*Engineering Weekly.*

PROVISION FOR TORPEDO CRAFT.—Another factor which must be emphasized is the peril which we shall run if the Admiralty pursues its present policy in reference to torpedo craft. Under the present naval program we are laying down only four more destroyers than Germany, and we are devoting the same sum to the construction of submarines. When Mr. Churchill was defining the British standard of British battleship construction, he declared that there were "other and higher standards for smaller vessels." What those standards are he did not state, but certainly they are not represented in the 1913 shipbuilding program. Indeed, the provision made for torpedo craft, above and under water, represents little more than

a one-power standard. We cannot, except at the gravest peril, neglect this branch of naval construction. Upon these vessels the best naval opinion is relying in ever-increasing degree. It is true that we have a considerable superiority in submarines built before Germany turned her attention to the construction of vessels of this type, but many of these early British submarines which still figure in lists of comparative strength are obsolescent, and must be replaced. The importance which the German naval authorities attach to the submarine is attested by the fact that they are spending upon these craft about £1,000,000 each year. This energetic policy will lead to a great expansion of German flotillas during the next few years, and it is essential that we should take reciprocal action.—*Naval and Military Record.*

THE SUBMARINE CRUISER.—There is no department in the British Navy in which more satisfactory progress has been made than in the submarine branch. Starting a long way behind France, who first developed this kind of craft on modern lines, and even behind America with her few boats of the *Holland* type, we have steadily improved our position until to-day we stand preeminent in the world's navies with our means of under-water attack and defence. There was a time when to talk about under-water craft eventually taking on the duties of surface cruisers, in home waters and the near seas, was to expose oneself to ridicule. This, however, is no longer the case, and in naval circles it is anticipated that naval designers will, at no distant date, give the British Navy vessels which will be capable of the double functions of surface and under-water fighting, and also be useful for scouting purposes. The present drawback is the limited speed of submarines on the surface; but this limit is being daily overcome and the latest vessels can now travel faster over the water, when not submerged, than our earlier type of torpedo-boats and destroyers. The tonnage of the latest type of our under-water fighters exceeds 700 tons, which is more than many of the gunboats displaced in our old fleet, and this displacement is still on the increase at such a rate that we shall soon have submarines with displacements as large as our light cruisers. The designers and engineers will then only have to shape and engine these vessels so that a cruiser speed can be obtained, and they will be able to give us submarine cruisers of the highest possible value for scouting purposes at moderate distances.—*United Service Gazette.*

JEALOUSLY GUARDED SUBMARINE.—The most jealously guarded vessel in all the shipbuilding yards on the Clyde is the submarine known as *S 1*, which was launched from Messrs. Scott's Shipbuilding and Engineering Yard, Greenock, for the British Government. No one is allowed to approach the vessel without an official permit, and when she is slipped into the water it will be done quite privately, only Admiralty officials and the builders' workmen being present. The submarine is of the *Laurenti* type, as built by the Fiat San Giorgio Company, of Spezia, and for the construction of which Scotts' Company hold the license in Great Britain. The *S 1* will be propelled by twin-screw Fiat internal combustion engines when afloat, and by electric motors when submerged. This will be the first submarine to be constructed in Great Britain elsewhere than at Barrow-in-Furness and in the royal dockyards. It is believed that there are certain unique features about this vessel.—*Standard.*

The inner hull is divided into water-tight compartments. The keel, which weighs about 12 tons, is detachable from the interior of the vessel, so that the weight can be decreased while under water. There are "escapes" to be used in case of accident. When the submersible is under water a buoy can be liberated from the deck. Inside the buoy is a telephone, and wires inside a hollow flexible hawser connect the buoy and the submarine. By unscrewing the top of the buoy communication can be established from the surface to the crew beneath.—*Naval and Military Record.*

LOSS OF THE "A 7."—Whilst engaged in exercises in Whitsand Bay on January 16, 1914, the submarine *A 7*, with eleven men on board, tailed to rise after submersion. For several days a diligent search was made for the little vessel, and at length she was discovered lying half buried in sand at a depth of 140 feet. For many more days efforts were made to raise her, but without success, and the state of the tide put further operations out of the question early this week. As every delay causes her to sink deeper and deeper into the muddy sand, there can now be but little hope of bringing her to the surface again. Indeed, there seems but little reason for continuing the attempt. It is not probable that the cause of the accident could now be discovered from the wreck, and no more fitting burial for the brave men who lie dead in her could be found than that the service should be read over her and that she should be allowed to sink deeper and deeper into the sea bed. The class to which the *A 7* belongs contains the smallest of British submarines. They were the first to be made, and are quite out-dated by the larger and more modern vessels. Only nine were still in service, out of thirteen originally built, when the *A 7* went down, and all were reserved solely for the comparatively safe work of harbor defence. It is not impossible that provision for breaking up the remaining eight and replacing them will be made in the forthcoming navy estimates.—*Engineer.*

SUBMARINE "A 7."—The loss of a warship has aways to be measured in two terms—men and *matériel.* If it were not for the men who died in her, the disaster to the *A 7* would be of small account. She belongs to a class of which no more will ever be built, and which for some time past have been detailed for no more dangerous duties than those of harbor protection. They have been spoken of as "coffin ships," but there is no reason to suppose that they were exceptionally dangerous, at any rate whilst engaged upon the duties they were called upon to perform. The fact that six of the class have met with serious accidents does not, on examination, prove anything against the type, for the *A 7* alone has disappeared under circumstances which suggest a fault in the vessel herself. Three were sunk by collision, one by running under when maneuvering on the surface, and one by an explosion. It must be recalled also that the class has been longest in existence, has seen most service, and is therefore most likely to have suffered loss. Nevertheless the class is obsolete; it would probably be of little value in time of war, and the country would not be much the worse if the eight remaining vessels were broken up. There were originally thirteen, but up to last week only nine, numbering from 5 to 13, were still in the service. They were built in 1904 by Vickers, are 150 feet long, displace 204 tons submerged, and have engines of 600 horse-power. The *E* class, the latest vessels, are 176 feet long, displace 800 tons submerged, and have engines of 1600 horse-power, giving them a surface speed of 15 knots at least. Contrasting the two classes it is obvious that the *A's* are quite out of date, and the country would lose little by getting rid of them, whilst she would gain much if they were immediately replaced by more modern vessels. It is probable, too, that no submarine of a recent pattern could disappear so completely as the *A 7* did for nearly five days. More recent vessels are, we believe, fitted with telephone buoys, which can be released and float to the top in case of trouble, so that the sunken vessel may maintain communication with the surface. It would seem that the *A 7* lacks that appliance, for otherwise all trace of her could scarcely have been lost unless some extraordinary accident happened. She has been found lying at the bottom in twenty-three fathoms of water four miles west-north-west of Rame Head. Her salvage is spoken of with confidence, but the operation can scarcely fail to be long and tedious, and under the circumstances, the remarks about the need of having salvage vessels ready and waiting at all submarine stations have lost much of their relevancy. —*Engineer.*

SUBMARINE "A 7."—The naval authorities have reluctantly abandoned their efforts to raise the sunken submarine *A 7*, and her ill-fated crew will find in her a permanent tomb. Genuine sympathy will be felt with the distressed relatives, who are thus deprived of the sad privilege of laying their loved ones to rest in hallowed ground. Nor will this feeling be lessened by the fact that but for the refusal of the Admiralty to adopt measures which are taken in so backward a country as Russia with success so melancholy a result of the accident to *A 7* need not have been involved, if, indeed, it might not have been possible to raise the vessel in time to save life. With a proper means of indicating by an emergency buoy the situation of the vessel, she could, in all human probability, have been raised and brought into harbor. It was the several days spent in vainly searching for the submarine before she was found that enabled her to sink in the treacherous quicksands which form the flooring of Whitsand Bay, and so rendered it impossible to move her when, at a later date, the full strength of a powerful battleship was exerted to draw her out of the mud. The splendid spirit and discipline of the navy will no doubt always provide plenty of volunteers for the perilous submarine service; but the nation owes it to these brave men that no question of petty economy or official obstinacy shall hinder the effort to find some means of saving them in circumstances such as those in which the *A 7* failed to rise to the surface. —*Naval and Military Record.*

PERSONNEL

AGE OF FLAG OFFICERS.—One of the most interesting features of the recent series of changes in high commands announced by the Admiralty is the comparative ages of the officers concerned. Mr. Churchill has been assumed to be a strong partisan of the "younger admirals" school, but it is apparent that he realizes the limitations there must be to the justice or efficiency of enforcing any arbitrary age limit. Sir Berkeley Milne was 56 years of age when he was appointed to the Mediterranean command. His successor, Sir H. B. Jackson, is 59. The command of the first battle squadron affords an even more striking illustration of the "swing of the pendulum," for while the Hon. Sir Stanley Colville was only 51 when he took command, Sir Lewis Bayly will be within three months of completing his 57th year when he transfers his flag, assuming that he does so when Admiral Colville completes his two years in the appointment. There is no comparative change in the age of the officer commanding the third battle squadron, Vice-Admirals Bayly and Bradford both being 55 at the date of appointment; but in the case of the fourth battle squadron there is an advance of three years, Sir D. A. Gamble being 57, as compared with the 54 years of Sir Charles Briggs at the date of the latter's appointment in July, 1912. While on the subject it may be mentioned that at the end of this month considerable reductions will be made in the compulsory retiring ages in the Japanese Navy. That for admirals will be reduced from 68 to 65, for vice admirals from 63 to 60, and for rear admirals from 58 to 56. —*Naval and Military Record.*

ENGLISH NAVAL CADETS.—As one result of the investigations of Admiral Sir Reginald Custance's committee on the system of the entry and training of cadets and midshipmen, certain modifications have been made, and are this week officially announced, regarding the entry of naval cadets. The usual charge to parents is £75 per annum during the course of the training at Osborne and Dartmouth. The committee recommended that a certain number of entrants should only be charged £24 per annum, on the principle that genius is not the monopoly of the class which can afford to pay high fees. Hitherto "a limited number" of sons of officers of the navy, army, marines, or of civil officers under the Admiralty, were admitted under a reduced scale of £40 per annum. In the new regulations now issued, the number of officers' and officials' sons so admitted is not to exceed 10 per

cent of the total entrants, while others will be granted the same privilege up to 25 per cent of the total entrants. Thus, from the general community there will each year be entered 15 per cent of the total who will only be required to pay £40 per annum instead of £75; but if the sons of officers and officials fall below 10 per cent, the number from the general community will be increased proportionately.—*Army and Navy Gazette.*

TRIALS BY COURT MARTIAL.—In the entire British Navy in 1912 there were only 121 trials by court martial of enlisted men of the service and the marines. In 1911 there were 154, the largest number since 1907. The returns for 1913 have not yet been compiled—*Army and Navy News.*

CANADIAN NAVY PERSONNEL.—The annual report of the Naval Service Department shows that it is impossible to keep a sufficient complement of men on board the two war vessels of the Canadian Navy to enable them to undertake any prolonged cruises. The cadets who have passed their examinations at the Royal Naval College at Halifax were sent to undergo one year's seagoing training on board H. M. S. *Berwick.—Shipping,* Illustrated.

PROMOTION FROM THE LOWER DECK.—The Admiralty are losing no time in squaring up the policy of promotion from the lower deck. It has just been announced that it is intended to make provision for the advancement of artificer-engineers, chief engine-room artificers, and engine-room artificers so as to enable them to attain the rank of engineer-lieutenant earlier than is possible under existing regulations. Forthwith candidates are to be selected who will receive the rank of acting-mate (E.) with pay and messing allowance of ten shillings a day, and a grant for uniform of £25. On qualifying as mates (E.) they will receive a further uniform grant of £50, and the most eligible of them will eventually become engineer-lieutenants, receiving on promotion a further gratuity of £50 for uniform and outfit. Not every candidate who is selected for the rank of acting-mate (E.) can hope to reach commissioned rank, and it is announced that those who fail to qualify will be eligible to become artificer-engineers. It is evident that the Admiralty intend to select comparatively young men as candidates. This is in accordance with the scheme for the promotion of seamen petty officers to commissioned rank. It is anticipated that a somewhat similar concession will be made to writers. Rear Admiral Thursby's committee is investigating this subject, and, in view of the concessions already made to other lines, it would occasion no surprise if facilities were given to some of the younger writers to win promotion to commissioned rank. The Admiralty are obtaining as writers men of superior attainments, and, having opened the door to one line after another, it is hardly probable that the authorities will keep it closed to this deserving branch of His Majesty's service.—*Naval and Military Record.*

NEW CLASSES OF COMMISSIONED NAVAL OFFICERS.—There is no question but that the democracy are getting a foothold on the quarter decks of the navy. The year 1913 saw long strides in this direction. The executive warrant officers, and the petty officers of the lower deck, are going there at a great rate, as "mates" and will presently help to fill the attenuated lieutenants' lists. Not long ago the Admiralty provided for the promotion of smart young marines to the warrant officers' list after becoming specialists in gunnery, and this scheme has proved to be so satisfactory that during 1913 their Lordships also decided to give two marines from the ranks a commission each year. These men will be selected from warrant officers, non-commissioned officers, lance-corporals and bombardiers. The selected candidates will pass through courses arranged for them at the gunnery and torpedo schools at the Royal Naval College, Greenwich, and at Marine Headquarters. If they succeed in passing the various examinations at the establishments named they will join seagoing ships for practical work and experience for six months and then become eligible, if in all respects

satisfactory, for promotion to lieutenants, Royal Marines. The seamen and marines having been given this chance of entering the ward-room, the young warrants and petty officers of the engine-room branch cannot long be denied the same opportunities, and then in rapid succession will surely follow opportunities for the warrant and petty officers of all other large classes on the lower deck and the democratising of the quarter deck personnel of His Majesty's navy will be in an advanced state, while the navy itself will become more popular than ever among the poorer classes of the country.—*United Service Gazette.*

CHANGES IN DAILY ROUTINE.—The inquiries of various committees into the daily routine followed in seagoing ships of the home fleets has resulted in the trial of a new routine in all ships except the first battle-cruiser squadron. A separate routine will be drawn up to meet the needs of the latter vessels. The routine is to be carried out in principle, and as near as practicable to the details arranged, and the results of the trial are to be reported on June 1.

For seamen ratings the breakfast time has been increased to fifty-five minutes. On week days seamen will go to breakfast and shift into the rig of the day before cleaning mess decks. One cook of each mess will be sent below at 7 a. m. to draw and prepare the meat for the day's dinner, and to clear up the mess for breakfast. Sea routine will conform to harbor routine, except that middle watchmen will be allowed to rest until 6 or 6.15 a. m.

On Sundays all cleaning will be done before the men shift into the dress of the day. After 9.30 divisions it is recommended that men fall out, but remain on the upper deck whilst the captain inspects the mess decks.

The routine will be as follows:

WEEK DAYS

(a) *Upper-Deck Ratings*

5.15 a. m.—Boys turn out.
5.30 a. m.—Hands turn out.
6.00 a. m.—Fall in; clean upper deck.
7.00 a. m.—Clean guns.
7.30 a. m.—Breakfast.
8.25 a. m.—Clean mess deck.
9.10 a. m.—Divisions; prayers; physical drill.

NOTE.—On Saturdays the times for turning out and falling in to be a quarter or half an hour earlier as necessary, the subsequent routine being amended as desired.

(b) *Engine-Room Ratings (Except E. R. A.'s and Mechanicians)*

6.00 a. m.—Turn out.
6.15-7.25 a. m.—Clean mess deck and breakfast as convenient.
7.25 a. m.—Fall in below.
7.30 a. m.—Start work.

NOTE.—In ships where a large number of stokers second class are borne it is proposed that, in suitable weather, they should be turned out ten minutes earlier and go to physical drill from 6.15 to 6.30.

(c) *Engine-Room Artificers and Mechanicians*

6.15 a. m.—Turn out.
6.30-7.30 a. m.—Breakfast and clean for work.
7.30 a. m.—Start work.
11.40 a. m.—Return tools and wash.
Noon.—Dinner.
1.15 p. m.—Turn to.
4.15 p. m.—Return tools.

(d) *Artisan Ratings*

6.15 a. m.—Turn out.
6.40 a. m.—Turn to.
7.30 a. m.—Breakfast.
8.25 a. m.—Turn to, except those required for cleaning mess deck, who should turn to at 9.00 a. m.

NOTE.—Carpenters and shipwright ratings required on deck for rigging hoses, etc., for scrubbing decks, to turn out with the hands.

SUNDAYS

5.45 a. m.—Turn out (stokers 6.00 a. m.).
6.15 a. m.—Fall in.
7.40 a. m.—Pipe down.
8.00 a. m.—Breakfast.
9.30 a. m.—Divisions.—*Naval and Military Record.*

TRIUMPH OF BRITISH FIRMS IN FOREIGN COMPETITION.—British firms are achieving great successes in the competition for naval orders which is now in progress. The latest triumph has been achieved in Turkey, where Rear Admiral Sir Charles Ottley, on behalf of Armstrong, Whitworth & Co., and Sir Vincent Caillard, in the name of Messrs. Vickers, have just completed an important contract. Under this agreement the government will hand over to the Armstrong-Vickers group the existing arsenal and docks on the Golden Horn, with all the machinery and buildings, and will also provide a site for a naval base at Ismid. Among other things, it is intended to build a floating dock capable of taking the largest unit. The capital necessary for this enterprise will be obtained by the creation of a new Ottoman Company, of which the administration will be partly British and partly Turkish, the English directors being in a minority. On the one hand, the Porte grants to the company for a period of thirty years the exclusive right of carrying out all naval repairs for the Turkish Government, and, on its part, the new company undertakes to reorganize the shipbuilding yards and workshops in such a manner that at the end of twelve years the dockyards at the Golden Horn and Ismid will be able to build hulls and engines of all types. The keenest competition by foreign firms preceded the conclusion of this English contract, and the achievement of Sir Charles Ottley and Sir Vincent Caillard will be recognized as a notable triumph for British industry, particularly if it be borne in mind that this country has in Turkey at this moment a naval mission under Rear Admiral Tufnell. It is a remarkable testimony to the position in which this country stands that in their naval difficulties all the lesser powers of the world turn to us for advice and guidance. The result is not only to find profitable employment for British capital, but to open new fields for British industry, and thus the working classes of this country directly benefit from the pre-eminence of these great armament firms.—*Naval and Military Record.*

ARMING MERCHANT SHIPS.—The British Admiralty have issued the following list of merchant ships, which, up to the end of December had been "armed with guns for the purpose of self-defence":

Royal Mail Steam Packet Co.—*Aragon, Amazon, Asturias, Deseado, Desna, Drina, Demerara,* and *Darro.*

White Star Line.—*Ceramic, Corinthic, Cufic, Afric, Medic, Tropic, Suevic, Persic, Zealandic,* and *Runic.*

Messrs. Houlder Bros.—*La Correntina, La Rosarina, La Negra, El Uruguayo,* and *El Paraguayo.*

Federal Steam Navigation Co.—*Wiltshire* and *Shropshire.*

Aberdeen Line.—*Themistocles.*

New Zealand Shipping Co.—*Rotorua.*

Scottish Shire Line.—*Argyllshire.*

Each vessel carries two 4.7-inch guns mounted at the stern.—*Shipping Illustrated.*

INEFFECTIVE SHIPS.—*Twenty-Four on the Sale List.*—Ten more vessels (including three battleships and four light cruisers built under the naval defence act) have been transferred to the sale list of the Royal Navy as obsolete, namely: The battleships *Resolution* (launched at Yarrow May 28, 1892), *Hood* (launched at Chatham July 30, 1891), and *Revenge* (launched at Jarrow May 28, 1892), the light cruisers *Cambrian* (launched at Pembroke January 30, 1893), *Forte* (launched at Chatham December 12, 1893), *Scylla, Æolus, Perseus,* and *Medea,* and the *Otter,* destroyer. The light cruisers have all returned to England comparatively recently from foreign service, and the *Otter* was recently paid off at Hong-kong.

According to the February navy list, there are now 24 vessels on the sale list, the other 14 being the battleship *Renown,* the light cruisers *Barham, Flora,* and *Promtheus,* destroyers *Foam, Handy, Janus, Taku, Virago,* and *Whiting,* the sailing sloop *Cruiser* (late *Lark*), the coastguard cruiser *Colleen,* the hulk *Carnatic* (late floating powder magazine), and the hulk *Britannia* (late training ship for naval cadets).

With the transfer of the *Resolution, Hood,* and *Revenge* to the sale list, the whole of the eight battleships built under the naval defence act have been removed from the effective list, the *Repulse, Royal Oak, Royal Sovereign,* and *Ramillies* having been sold to the shipbreakers, whilst the *Empress of India* sank in the Channel off Portland after experimental firing.—*Naval and Military Record.*

"IMMEDIATE WAR."—"Immediate war" is the demand of a writer in the well-known Berlin paper *The Post.* The entire front page recently was given up to a lengthy article culminating in a frank and unabashed demand for immediate war as the only means of "extricating Germany from an intolerable situation that has a tendency," it was declared, "to become worse for her instead of better." "What are we to do?" this writer asked. "Are we really to wait quietly until Austria is completely shaken to pieces, until Italy must bow before the overwhelming influence of the sea powers, and we, in isolation, are confronted by the arrogance of France, Russia, and England? Is the German nation of 70,000,000 really to renounce the rôle of leader in Europe which is its due?" To this question the article returns no uncertain answer:

"In the lives of nations there are complications and dangers which can only be disposed of by the sword. . . . . Our nation to-day belongs to this category. . . . . At the moment the conditions are favorable. France is not ready to fight. England is involved in internal and colonial difficulties, Russia shrinks from war, because she fears a revolution. Shall we wait until our opponents are ready, or shall we use the favorable moment to force a decision? When a conflict of interests shows itself we should not give way, but let it come to war, and commence it with a determined offensive, whether it be for a new Morocco, for the position of General von Liman, or the Asia Minor question. The pretext is a matter of indifference, for the point is not that, but our whole future which is at stake."

As the Berlin correspondent of *The Daily Telegraph* points out, the significance of anything that is said by *The Post* arises, not from the handful of excitable pan-Germans who form the bulk of its few readers, but from the fact that it is the recognized official organ of the Imperial party, which contains a larger proportion of princes, retired generals, ministers, and other leading officials than any other group in the Reichstag.

AS OTHERS SEE US.—It is unpleasant to be criticized by foreigners, especially when those foreigners are experts in the subject which they are remarking upon. Consequently when we find Lieut. Colonel Le Juge, a well-known German critic of English military matters, expressing the opinion that, after immature and incapable recruits are deducted, England could not send more than 70,000 to 80,000 effective soldiers abroad in case of a continental war, we may not unreasonably expect that the opinion entertained by foreign nations, even those included with us in the "Triple

Entente," of our military value as an ally will not be a very high one. Then, again, when a German paper of repute states that the real reason why there are to be no grand maneuvers in the English fleet this year is that the ships cannot be properly manned, and that the men we have are so overworked through the short-handed state of the vessels that they are in a state of discontent, we must expect that foreign nations, Germany for instance, will form a lower impression than before of the fighting capacity of the British Navy.—*Naval and Military Record.*

CANADA SIDESTEPS NAVAL POLICY.—The Canadian Parliament opened January 14 at Ottawa, and one of the first announcements was to the effect that no naval program would be launched this year. At the last session it will be remembered a bill appropriating $35,000,000 for the construction of three battleships to be assigned to the British Home Fleet was brought in by the government, but defeated, hence it was not deemed advisable to suggest naval legislation at this session.—*Marine Journal.*

NAVAL WORKS AT GIBRALTAR.—An interesting description has been given by Mr. Adam Scott to the Institution of Civil Engineers of the harbor work and docks extensions carried out at Gibraltar, the result of which, he said, had been to provide a modern dockyard capable of dealing with repairs of the heaviest class, and, in fact, of doing everything except build vessels. The principal works consisted of a southern breakwater extension having a total length of 2700 feet, including the 100 feet begun in 1893; a detached breakwater 2720 feet long between the north and south breakwaters; a large northern mole, with coaling jetties and viaduct; an extended naval yard, with three large graving docks, slipways for destroyers, and subsidiary equipment; and the dredging of the harbor. The harbor has two entrances, the northern 650 feet wide and the southern 600 feet, and the enclosed water area is about 440 acres, of which about 260 acres have a minimum depth of 30 feet at low water. The area added to the dockyard proper by reclamation from the sea is about 43 acres, and the new buildings cover about 11 acres. There are more than 1600 lineal feet of retaining walls round the head of No. 1 dock and at the dockyard south entrance. The site of the large dock, No. 1 was about half on land and half in the sea; that of No. 2 practically and of No. 3 entirely in the sea. The three docks are all of the same type, the entrances and widths being identical; only the lengths vary, No. 1 dock being a double dock with an intermediate sliding caisson, while the other two are single.

YARROW'S NEW WORKS IN BRITISH COLUMBIA.—Advices by mail give full details of the fact, already received by cable, that Mr. A. F. Yarrow has purchased an existing shipbuilding and repairing works in British Columbia. The works are those of the British Columbia Marine Railway Company, and are situated at Esquimalt, in Victoria. This company was founded in 1893 by Messrs. Bullen Brothers, who have since achieved a large measure of success. The extent of the establishment at present is 8 acres, and there is included a slipway—or, as it is known in Canada, a marine railway—capable of taking vessels 300 feet in length, ship-platers' and boiler works, forge, machine and joiner shops. The price paid, it is said, although not officially, is £200,000. For some time after being founded, the establishment was confined to repair work, several British warships being overhauled. The reconstruction almost entirely of the double bottom of H. M. S. *Flora* suggested the suitability of the plant for shipbuilding, and since then quite a number of vessels have been built, including vessels for the Canadian Pacific Railway's coastal service, and for the Dominion Government marine survey. Only continuity of orders seemed to be required to ensure full success. As many as 600 men have been employed at busy times. Mr. Yarrow, who went to the Pacific coast with the view of choosing a site for new works, in the belief that the opening of the Panama Canal would considerably improve the potentialities of success in ship-

building in British Columbia, was influenced in his decision to purchase the works by the fact that the government at Ottawa had decided to construct, on a site adjoining the works, a graving dock 1150 feet long, 120 feet width of entrance, and 40 feet depth of water on sill, at a cost of £200,000. Mr. Yarrow has been expressing his views as to his future arrangements. Although the parent company at Scotstoun on the Clyde will be in close touch with the new concern, which will be managed by Mr. Yarrow's second son, Mr. Norman Yarrow, the two firms will be separate affairs. For the present, Mr. Keay, a member of the Scotstoun staff, is to remain at Esquimalt until Mr. Norman Yarrow takes over control. Continuing, Mr. Yarrow said the present idea of the firm is to undertake repairs to vessels and their machinery, and to be on the spot ready to build for the Canadian Navy vessels of the class with which the firm are familiar, and for which they have a reputation, "if the laws in Canada are altered so that shipbuilding can be carried on profitably." On this point, Mr. Yarrow said he had come to the conclusion that a bounty of not less than 30 per cent of the value of the vessel would be necessary for the first five years; for the next five years 25 per cent, for the next five years 20 per cent, and for the next five years 15 per cent; after that time the needs of the shipbuilding industry would depend upon the development of the natural resources of the country. Of course, no industry like shipbuilding could be developed quickly. As a finance minister did not want to be faced with an unlimited liability, he suggested that the bounty payable should be limited to a suitable total amount. As it was now, the duty upon imported material for shipbuilding seemed to be of no possible use. It brought no revenue to the country, because little or no shipbuilding was carried on. Elaborating his argument for the development of an industry in Canada Mr. Yarrow said that in the event of the Canadian Government ordering, say, ten destroyers in six years, the first two should be completely built in the Old Country and sent over in pieces; but the others would be laid down in Esquimalt in pairs, and a steadily decreasing amount of work would be done on each in the Mother Country until the last two, which could be built at Esquimalt exactly as they were on the Clyde, in which case even there were certain arts which the firm had to get from special makers.—*Engineering.*

BRITISH NAVAL POSITION IN MEDITERRANEAN.—The outlook is darkened by the negotiations of Italy for the purchase of the battleship now completing at Elswick to the order of the Brazilian Government. If the purchase is completed this ship will leave in the spring for the Mediterranean. What then will be the position? Italy will possess four, and possibly five, completed dreadnoughts, with six others under construction. She will be at least twice as strong as Austria in ships of the latest class. But it is a mistake, as has been repeatedly insisted in these columns, to calculate naval strength merely in dreadnoughts. It is impossible at this stage of naval development to ignore ships with mixed armament. Of large armored units of the battleship type Italy will possess 12 or 13 by next spring, with 5 armored cruisers, 4 protected cruisers, 22 destroyers, and 18 submarines. At the same time Austria will have at least 11 battleships, one armored cruiser of medium power, 4 protected cruisers, 8 destroyers, and 6 submarines. Our position in the Mediterranean tends steadily to become worse. It may be hoped that when Parliament meets not merely unionists, but far-seeing supporters of the government—and there are to their credit Liberal M. P.'s prominently associated with the Navy League—will seize every opportunity of riveting the attention of the country upon this problem. It has been stated that the Cabinet is determined to retain a one-power standard squadron in this sea. Something has already been done to strengthen our position, but much more remains to be done. The forecasted programs of construction make no adequate provision for maintaining the position in the Mediterranean which the Cabinet has declared to be its policy to assure to us. It may be hoped that immediately

the House of Commons reassembles the government will be questioned on this aspect of naval policy.—*Naval and Military Record.*

"NO GRAND MANEUVERS."—In the terms of Mr. Churchill's reply in the House of Commons, there are to be no "grand maneuvers" this year, but instead a test mobilization will be made of the third fleet, which is maintained on the nucleus crew system. Economy is admitted by the First Lord of the Admiralty to be the reason for curtailing this year's war training program. It is apparent from this that severe measures have been taken to keep down naval expenditure during the coming financial year. It is said that last year's exercises cost round about half a million, and, if any such sum can be saved this year, to this extent the Admiralty will be able to meet the claims of the little navy section of the radical party. Presumably Mr. Churchill will give some explanation of the Admiralty's decision when he introduces the navy estimates. During the past two years the maneuvers have been on a particularly elaborate scale. Last summer, for instance, no fewer than 46 battleships, 38 cruisers, 16 light cruisers, 160 destroyers, 48 submarines, and 28 other vessels took part in the exercises in the North Sea. The aim was to provide data bearing upon the invasion problem, and it is understood that at an early date Mr. Asquith will explain the conclusions which have been reached. Whether or not there are other strategical or tactical problems which might advisedly be submitted for practical study is a question with which perhaps the First Lord will deal. The "ordinary naval maneuvers," as Mr. Churchill describes the practice cruises, will take place as usual, but their instructional value is small compared with that derived from the practical study of such problems as are usually set for the annual maneuvers. The test mobilization of the third fleet in lieu of the grand maneuvers has no doubt been adopted so as to enable reservists and naval volunteers to put in a period of service afloat, but even so the decision of the Admiralty will impose a serious restriction by excluding a large number of officers and men from taking part in a phase of training without which it is impossible to attain a high standard of efficiency.—*Naval and Military Record.*

OIL STATION.—The Admiralty, it is said, intends shortly to establish an oil station at Blackness, on the Firth of Forth. The reason given is that Blackness is so near the oil works of Linlithgowshire that the oil could easily be shipped. It is believed that the oil would be pumped from the works to the shore.—*Engineer.*

SIR E. GREY ON ARMAMENTS.—Sir Edward Grey has seldom spoken more wisely that he did in Manchester last week, and his contribution to the armaments problem has again stamped him as a statesman in the eyes of Europe. By implication he reproved certain of his colleagues in the Cabinet for their exceedingly cheap denunciation of our expenditure on defence. "I could be no less eloquent," he observed, "but if I were, should we be any further forward to-morrow?" Our Foreign Minister gave the same reason for omitting to wax eloquent upon the vital importance of the navy, but some may regret his restraint on that point. There is a manifest need of such eloquence from the few statesmen we possess just now. With regard to naval retrenchment by this or any other power, Sir Edward Grey clearly indicated the futility of isolated action. It is to be hoped that his warning on that subject will be digested by the public. He said that "while any large increase of expenditure on the shipbuilding program of any great country in Europe has a stimulating effect in other countries, it does not follow that a slackening in the expenditure of one country produces a diminution in the expenditure of others." That was a sound reproof to the enthusiasts of the Hirst-Brunner school, who would risk our ruin as a nation to save a few millions.—*Naval and Military Record.*

THE 16 TO 10 RATIO.—Two years ago Mr. Churchill referred to a margin of naval strength of 16 to 10 as against Germany. A few days since

Admiral von Tirpitz, ignoring the conditions which Mr. Churchill laid down, was good enough to say that such a formula would be regarded by Germany as "acceptable." Two years is a long period to elapse, and perhaps Admiral Tirpitz has forgotten the exact terms of Mr. Churchill's speech. Certainly many people in this country have quite a wrong impression of what Mr. Churchill actually said. He explained why the Admiralty abandoned the two-power standard and then he told the House that "the actual standard of new construction which the Admiralty had, in fact, followed during recent years, had been to develop a 60 per cent superiority in vessels of the dreadnought type over the German Navy on the basis of the existing fleet law," while there were "other and higher standards for smaller vessels." Proceeding to explain the future of the Admiralty policy, Mr. Churchill said (a) "if Germany were to adhere to her existing law," and (b) if there were no "unexpected developments in other countries," that standard would be "a convenient guide for the next four or five years, so far as this capital class of vessel was concerned." Mr. Churchill's statement was very concise, and it was conditional, and in order that there might be no mistake, he added: "I must not, however, be taken as agreeing that the ratio of 16 to 10 should be regarded as a sufficient preponderance for British naval strength, as a whole, above that of the next strongest naval power." The First Lord then told the House of Commons why, in the absence of fresh shipbuilding programs by Germany or other countries, we were able "for the present to adhere to so moderate a standard." He pointed to our great superiority in vessels of the pre-dreadnought era, and reminded Parliament that every additional dreadnought added to the German fleet—and he might have added to the fleets of Italy and Austria—would accelerate the decline in the relative fighting value of our pre-dreadnoughts, and would therefore require "special measures on our part." Then it was that Mr. Churchill announced that for every ship which Germany laid down over and above her existing program we should build two. When Germany passed a new fleet law providing for the building of additional ships, she killed the 16 to 10 formula, and Italy and Austria by their acts have since buried it.—*Naval and Military Record.*

"AN OMINOUS PARALLEL."—*France 1866-70: The United Kingdom 1903-13.*—The breakdown of the territorial force as a link in the chain for home defence is described by Lord Roberts in a notable article with the above-quoted headlines, which appears in *The National Review.* The veteran field-marshal also draws a significant parallel between the attitude of the present government towards the military position and that of the French Government shortly before the Franco-German war. As to the fact of the breakdown, he says, there is no need to labor the point. It was openly admitted by Colonel Seely himself in the House of Commons in April last, when he confessed to the House that "they had failed in achievement." The figures are too ominous to be explained away. Out of an establishment of 312,319, the territorials can only show a strength of 245,000. There is consequently a shortage of 67,319 men. "If the territorial force is a failure," continues Lord Roberts, "the special reserve is an even worse failure," and he goes on to show that the numbers have dwindled and the training has been cut down. So serious has become the position of the auxiliary forces that Sir Evelyn Wood recently resigned the chairmanship of the City of London Territorial Association rather than appear to acquiesce in such a state of affairs. Lord Roberts contends that ministers are afraid to take the people into their confidence or acknowledge how great is the danger which confronts the nation. Colonel Seely has issued one or two vague warnings, but the liberal party, sufficiently distracted over the navy estimates, are not in a mood to tolerate demands on behalf of the army.

Very similar was the condition of things which prevailed in France before 1870, and it is not without interest to note that the French Government

met the problem in the ways adopted by Mr. Asquith's Ministry. The French Emperor urged his War Minister to propose universal military service for France. This policy was scouted, however, by a commission, although the soldiers implored the government to tell the nation the truth and rely upon their patriotism. After Sadowa, a bill for obligatory personal service was proposed to Parliament, but declared to be "impracticable for France." Then the authorities grew alarmed at Prussia's preparations, and in desperation began to agitate for a reduction of armaments. They dared not make a proposal to Bismarck directly, but used the British Government as an intermediary. Brigadier General F. G. Stone, writing in "The Nineteenth Century and After," traces the overtures in detail, and his article should be read in conjunction with that of Lord Roberts. Lord Clarendon drew up a memorandum, with the sanction of the Queen and Mr. Gladstone, deploring the existence of the enormous standing armies, and declaring that Prussia, better than any other power, could carry out the glorious work of modifying it. Bismarck's feelings on receiving the memorial can be better imagined than described. In a few months more France and Germany were locked together in deadly warfare. The reason given by France for not preparing herself against Prussia could be used word for word by the present ministry. Lord Lyons wrote that "M. Emile Ollivier explained the position of the present French ministers with regard to the subject (of disarmament). They depended, he said, principally on the great agricultural population of France for support against socialism and radicalism. It was essential, therefore, that they should do something for that population. To conciliate them either taxes might be remitted or the call upon them for recruits be diminished." The disastrous defeat was the sequel, and the price to be paid for such weakness was 200 millions sterling in a war indemnity, the loss of two rich provinces, and countless lives. The moral is plain to see. South Africa gave its warning to England, and it can be neglected only at her peril.—*Naval and Military Record.*

RECENT BRITISH TORPEDO-BOAT DESTROYER CONSTRUCTION.—The twenty boats of the 1911-12 type represented a great improvement over the designs of the two preceding years. All these boats except one—H. M. S. *Hardy*—are of the uniform Admiralty design. They are 260 feet long by 27 feet 9 inches beam and displace normally about 950 tons. Oil fuel is provided for the four boilers, and twin-screw machinery of 25,000 horse-power has enabled a speed of 32 knots to be obtained. The armament and speed are for once highly satisfactory for boats of this size when the other features of the design are considered. Three 4-inch guns are mounted on the center line, as well as two pairs of 21-inch tubes, making these craft as far as concerns armament and its arrangement—a concomitant influence of almost paramount importance—quite the most powerful craft of their type afloat. So much so, in fact, might this be said to be the case—and that without any exaggeration—that the result of even a day action between three or four of these craft and a single big battleship or battle-cruiser need by no means be a foregone conclusion, unless it be in favor of the torpedo craft. For the speed and range of the automobile torpedo are now so great, and the accuracy so improved, as to render shooting at a 600-foot target not merely a blind chance even at 6000 or 7000 yards, at which range a 4-inch gun would find a destroyer a difficult mark to hit, but at which a big ship would not be a very difficult target. A 6-inch gun on the big ship would be no better, but the question of the reintroduction of such a weapon, while it has an important influence on destroyer design, is hardly germane in this article. For a solitary 22-knot battleship to be caught by four boats of this type might prove a very serious, if not a fatal, matter for her, unless her gunlayers could hit destroyers with big guns. Probably the most approved remedy is a 12-inch shrapnel, but the introduction of torpedo craft of this power is tending to force upon the bigger navies a new type of vessel represented for the first time by the British

Aurora, which is a hybrid between a destroyer and light cruiser, with functions which only a vessel of her dimensions could fulfil. The truth is that the 21-inch hot-air torpedo has outranged the heaviest hand-fed quick-firing gun when the range and relative sizes of target are considered. When once that broad essential fact is realized we shall hear less of the return to secondary batteries for use in battle. True, the 6-inch gun will keep even the biggest destroyer at a distance—that distance being the range at which it can be relied on to hit the destroyer. Outside that range what is the remedy? Apparently, when all is taken into consideration, it is considered better to mount the 6-inch gun in an auxiliary vessel that can stand between the battleship and the destroyer. That this auxiliary vessel, assuming her to be an *Aurora* with six 6-inch guns, will have an unhappy experience at the hands of four *L* class boats is very certain, for the simple reason that, even speed apart, she also is big enough to hit with a torpedo. Many years of experience have shown that the 6-inch gun is the biggest man-handled quick-firer that can reasonably be considered; the weight of its shell—100 pounds—and its muzzle velocity are now practically at their maximum, whereas it is only necessary to add 3 inches to the diameter of the torpedo, and it is on almost level terms as regards range with the 12-inch gun. The intermediate type of ship, whatever may be her rôle for foreign stations, seems likely to fall into the same category as the 6-inch gun. Her speed cannot be much improved except at an enormous sacrifice of displacement to machinery weight, whereas the absolute size of the destroyer is now very considerable, and the fighting power for a broadside action considerably greater than that of vessels of much greater tonnage than the two combined.

Reviewing Admiralty destroyer construction in the light of the vessels of the last two years' programs—those now under construction being virtually replicas of last year's boats—it is impossible not to feel satisfied with the type that has been evolved in the last five years. It is hard to see why such a low speed was aimed at for the craft which were built in 1909 and 1910, in view of the average 32 knots of the German boats, except for the fact that they were expected to maintain it at sea; but it must be remembered that the British destroyers attained their 28 knots with oil fuel and are able to maintain it while the fuel lasts, but the German boats of that period have three coal and one oil-fired boiler, all of which had to be very severely forced on a trial of much less duration in order to obtain their high speed. Although the list of the German vessels built during the period under review has been added for the sake of comparison, it is intended to deal with them separately in a future article. Their contemporary construction is given here to indicate how, year by year, the Admiralty programs have allowed for a very reasonable margin both in size and number. There are now, including the 1913-14 order, no less than 109 British destroyers built and building since April, 1909, compared with the 60—one of which has since been sunk, unfortunately with considerable loss of life—built in Germany. It will be noticed that Schichau, Krupp, and the Vulkan Company are the only builders with experience of destroyer construction in Germany, whereas in this country we have no less than twelve and even fourteen firms which have constructed modern torpedo craft. This position can only give us satisfaction.

As regards future construction, it seems most improbable at the moment that any reduction in size or speed should be contemplated, especially the latter, which should always tend to increase. The question, however, of the relative importance of the submarine, which is annually growing in size, speed, and offensive qualities, may cause a diminution to be made in the number of destroyers ordered in suceeding years, though a stop is not likely. Peace maneuvers with submarines are even more misleading than with destroyers, for, whereas in war time a periscope would be anathema and a thing to be deliberately run down, in peace time a weighted broomstick, as was proved during the last maneuvers, was sufficient to cause far greater anxiety to avoid contact with a submerged hull than was ever the

case with *vis-à-vis* destroyers attacking with lights out. But without wishing to minimize the excellent work done by the submarines in last year's mimic war, it is impossible to conceive conditions in war time when we could have too many destroyers. Even the altogether overwhelming superiority in boats of this class that the Japanese possessed at Tshushima was not found to be excessive, though the fullest use was not made of them at any period of the war. The direction in which we might reasonably look for further developments in type is in the reintroduction of boats as opposed to destroyers. Possibly something of the *Lurcher* type and speed with two pairs of tubes might be made to fill a most satisfactory rôle supplementary to that of an enlarged *M* class destroyer, which type is increasing too much in size properly to fill the rôle of torpedo-boats as they used to be understood. Nowadays the torpedo can be used to fight and does not depend upon surprise for success.—*Engineer.*

TWO NEW TYPES OF BRITISH SUBMARINES BEING EVOLVED.—Rather unexpectedly the name of the destroyer *Nautilus,* of the Fifth Mediterranean Destroyer flotilla, has been changed to *Grampus.* The vessel belongs to the *Beagle* class of sixteen ships, which were transferred from Harwich to the Mediterranean last November, in order to strengthen the British position in that sea. This group is known as the *G* class, in accordance with the new system of nomenclature; consequently the new name begins with that letter. When the system was adopted it was not considered expedient to re-name the whole group, as in the case of the *L* class, which were originally known as the *Darings,* because the *G* class have been in service for some time. The reason for re-naming the *Nautilus* is stated to be that the name has been earmarked for a submarine under construction at Chatham, which is to be the largest of her type in existence, and to be more like a surface craft than any submarine yet built. The Admiralty are attempting to evolve two distinct types of submarine. One type will be of moderate size and limited radius of action destined for coast defence. The other is very much larger and is intended to cruise with the fleets at sea. To make this feasible the *Nautilus* will have to be large enough to be at least as seaworthy while on the surface as the latest types of destroyers. To keep up with modern battle squadrons, her surface speed will have to be not less than 21 knots, while her submerged or battle speed will probably be about 15-16 knots. For offensive purposes the new type may be expected to have at least six torpedo tubes, although modern French craft have no less than eight, together with a pair of quick-firing guns, for repelling hostile aerial attacks, or to avoid being caught unawares by destroyers when rising to the surface.

To embody the above features the surface displacement of the new submarine would be not far short of 1500 tons, provided it is found possible to fit oil engines capable of driving her at 21 knots. A large part of the displacement will be given over to the extremely bulky battery required for running submerged, and there is a likelihood that electric motors will in consequence be exchanged in large submarines for an improved system of propulsion under water, involving less weight. Many experiments, which have hitherto met with scant success, have been made in this direction. In addition, space will be required for the crew, who will of course live in their vessel for considerable periods, and also for large supplies of fuel. The *E* class have a crew of 29 men, while the French 1000-ton submarines of the *Fulton* class have to provide accommodation for a crew of 40.

Finally, it is hoped, in view of recent events, that adequate safety arrangements in the shape of lifting eye-bolts, telephone buoys, and detachable compartments, not to mention the safety helmets already provided, will be fitted in all future submarines.—*Naval and Military Record.*

The Art of Long-range Hitting.—The basis of long-range gunnery is the capability in action of ascertaining the movements of the enemy, so as to cause the gun-sights to rise and fall in exact correspondence with the

changes of range which those movements bring about. To hit a ship at, say, 9000 yards it is necessary to aim at the position that ship will occupy when the projectile reaches her. Not only have the movements of the firing ship, and of the target, to be taken into consideration, but the time the shot takes in crossing the intervening distance. The spot to aim at can only be obtained by calculation based on the earlier courses and speeds of the two ships. This fundamental truth was first propounded in 1900; but it was not until four years later that an attempt was made to test experimentally the truth of the principle, with a view to its utilization in long-range firing. It was after this experiment that types of ships were adopted, designed specifically for obtaining an advantage at the longest ranges. As if in order to emphasize the fact that the policy of making long-range fire effective was bound up with the dreadnought design, the all-big-gun exceptionally-high-speed cruiser was adopted, as well as the all-big-gun high-speed battleship.

Every gunnery expert at once realized that with an increase of speed some form of organization for scientifically directing the aim had become necessary, for the greater the rate at which the ships move the greater the rate at which ranges alter. It is manifest that at long ranges the man behind the gun can form no judgment of the distance of the object he is to fire at. Thus some outside organization of men and instruments became necessary in order to obtain hits. The machinery for ensuring that the right range is on the sight at the moment of firing is what is called fire-control. It is not the business of fire-control instruments to find the range only, but to discover the speed and course of the target and to deduce therefrom the rate of change and the rule of the variation. It has also been learnt that no combination of individual effort, with its opportunities of error in transmission and its loss of time, can hope to transfer changes in speed and course and rate from the observers and calculators to the gun-sights sufficiently accurately and quickly to make hitting anything but a matter of chance. The operations must be synchronous, instantaneous, and extraordinarily exact.

It will be recalled that the ranges at Tsushima exceeded what most seamen thought the limits of effective marksmanship. Since that date improvements in guns have made hitting at still longer ranges possible. But these ranges will not be battle ranges unless change of range is eliminated from the problem. It can, of course, be eliminated tactically if the opposed ships keep the same course and speed. It is because in these conditions there is no change of range that some professional writers say that they are the only conditions in which gun-fire can be effective. This is to put a restriction on naval tactics, which, apparently, can only be removed if the change of range problem is to be solved by mechanical fire control. Here, at all events, is a field for inquiry and experiment. If guns can be enabled to hit under any conditions, the speed and long-range gun-power of the dreadnought fleet are justified. But if gunnery conditions are as limited as they seem to be to-day, wherein lies the justification for a continuance of the dreadnought policy?—*The Times.*

CHANGE OF RANGE IN ACTION.—The following excerpt from a letter written by Mr. A. H. Pollen in reply to an inquiry as to how great a change of range was to be expected in a modern engagement is reproduced from the *Engineering:*

The reason that Admiral Sir Reginald Custance and many other writers, both English, European, and American, have laid it down that naval gunnery can only be effective when opposing ships are on identical courses, and at approximately equal speeds, is that in any other relation there must be a changing range. It is therefore taken for granted that change of range is fatal to efficiency. This must obviously be so, if the factors creating the change, and hence the change itself, are unknown. But if these are known, the change can be instrumentally eliminated. The question is, How far are these factors ascertainable?

In a recent publication, Rear Admiral Bradley Fiske, of the American Navy, himself a pioneer of fire control, laid it down that a change of range of 160 yards a minute was considerably more than could be expected in action. Now 160 yards is a change of range which would be created if two ships going 2½ knots were to approach end on. The speed of the modern battle-cruiser is said to exceed 30 knots. If, therefore, two such ships were to approach end on at full speed, a change of range of over 2000 yards a minute would be created. This may be regarded as the maximum that *can* be created. The question I am asked is, What is the maximum that *will* be created? The reply can only be that it depends upon the tactical ideas of the leaders of the opposing forces.

It seems very obvious that there are two schools of tactical thought struggling for mastery in the navies of the world to-day. One school believes that, once in the neighborhood of the enemy, it will be possible to maneuver to obtain a favorable position before engaging in the final *mêlée* at short range. They think that, in the interval between the fleets being, so to speak, in sight of each other and close engagement, there is scope for the employment of tactical skill resulting in a relative distribution of forces that should be favorable to the side which is the better handled. It is thought that during these maneuvers possibly an overwhelming advantage may be obtained by long-range fire.

The other school holds that the moment an enemy is seen, the fleet should form as rapidly as possible and close immediately and at top speed to the range preferred for action, then to turn into a course parallel to the enemy's, so as to engage him in conditions as favorable as possible to the rapid and effective use of artillery. The first school relies upon the closing movements being more or less gradual at long range, so that the change of range would not be very high, and hence that gun-fire could reasonably be expected to be effective. The second school, however, have no intention of voluntarily submitting to long-range fire in such conditions, and rely upon the use of their speed to create so great a change of range during the approach as to afford an absolute protection against hostile artillery.

When the dreadnought design was first proposed it was officially given out that the purpose of giving these ships a high speed was to enable them to maintain a range favorable to the use of their long-range guns. It is obvious that if an enemy decides to close at top speed, the only way of "maintaining" a range is by retreat, and it is very doubtful to-day if any commander-in-chief would have the moral courage to order so extremely equivocal a movement. If, therefore, a force led by a tactician of the first school were to engage a force led by a tactician of the second, it seems clear that the first force, unwilling to increase the change of range by advancing on the enemy, and unable to reduce it by retreat, would be compelled to form in a line ahead, so as to receive the approaching enemy with the maximum number of guns bearing.

If this supposition is correct, while it may be impossible to answer the question, "What is the greatest change of range that may be expected?" it becomes obvious that the *minimum* change of range that must be expected is that which can be set up in these conditions. This minimum will naturally depend partly on the speed of the fleet attacked, but much more on the speed of the fleet attacking. The diagrams herewith illustrate this proposition generally.

Fig. 1 shows a "Black" fleet formed in line ahead, and travelling from left to right at 20 knots. The "White" fleet, also at 20 knots, is in line abreast, and is advancing approximately perpendicularly on the course of "Black." At each two minutes a slight change of course is made by "White," and at the tenth minute "White" turns together from line abreast to line ahead. so as to form up parallel to "Black."

The second diagram, Fig. 2, shows a time and range scale illustrating consecutive ranges from the first minute to the fourteenth, and the slope of this line indicates the rate from moment to moment. It will be seen that for the first minute and a half the rate is practically steady at 900 yards a

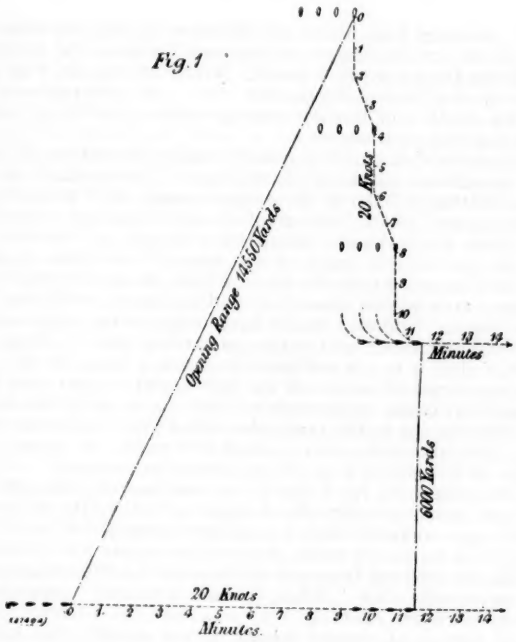


Fig. 1
Opening Range 14550 Yards
20 Knots
6000 Yards
Minutes
20 Knots
Minutes.

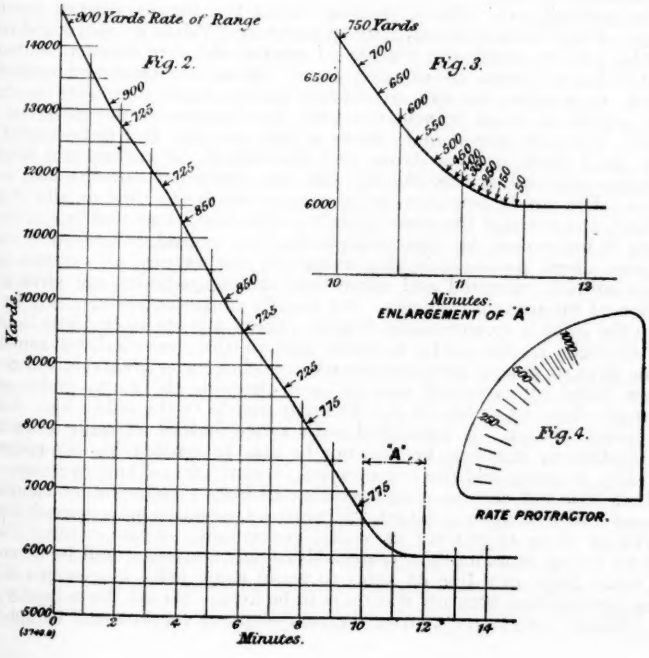


Fig. 2.
Yards.
Minutes.
Fig. 3.
Minutes.
ENLARGEMENT OF "A"
"A"
Fig. 4.
RATE PROTRACTOR.

minute; it changes then from 1½ minutes to 725, increases then to 850, drops again to 725, increases to 775, and between the tenth and twelfth minutes drops from 750 yards to nil. A rate protractor, Fig. 4, shows how the slope of the lines indicates the rate. An enlargement of the scale between the tenth and twelfth minutes shows, in Fig. 3, every 50 yards change in the rate as it occurs.

What is involved in enabling guns to maintain continuous hitting in such changing conditions as those illustrated? The standard of accuracy required for hitting is half of the danger space. If "White" is making an end-on attack on "Black," the artillery conditions are more favorable for "Black" than for "White," because the length of "White's" ships adds so much to the danger space of the target. At 14,000 yards, therefore, "Black" will have to know the range within about 100 yards (0.7 per cent), and at 7000 yards within about 125 (1.8 per cent). "White," supposing it wished to engage "Black," would have to know the range within 20 yards at 14,000 (0.14 per cent), and within 50 yards at 7000 (1.16 per cent).

It is clear that it is not sufficient to know a range at any one moment. A right range must be set on all the sights, and it must then be changed in exact accord with the movements of both ships, after allowance has been made for the change in the range that takes place while the projectile is in the air. This allowance may exceed 200 yards at 14,000 yards. Exact knowledge of the enemy's speed and course is essential.

It will be quite fatal for "Black" to continue the 900-yard rate into the third minute, when it is already changed to 725, while he could not obtain the initial rate correctly had he underestimated "White's" speed by 2 knots, or failed to get the exact angle of his course by ½ point. It is clear, too, that in the interval from the tenth to the twelfth minute, that the rate changes so rapidly that "White" could probably complete the turn to parallelism without running the smallest risk from "Black's" fire. "White's" period of danger would be not during this turn, but in the preliminary periods.

The possibility of "Black" hitting during this period depends upon two things. First, there is the capacity to ascertain "White's" speed and course exactly, and to check the change of course the very moment it occurs. Next, "Black" must be capable, once "White's" speed and course are known, to forecast the rate of change, and to cause the sights to change their setting in exact coincidence with the changes in the range as they occur. These are the primary needs of fire control. But to be useful they must, as I think is clear from this illustration, be carried out both instantaneously and synchronously with the occurrence of the two movements. The whole operation must occupy simply no time at all. That is the first, and perhaps the most difficult, of the conditions that has to be met.

But it must next be remembered that no tactical information can be obtained about an enemy's ship except by the agency of a range-finder. When suitably mounted and controlled, the range-finder can yield a succession of ranges and bearings. But usually range-finders can only be used when the light is exceptionally bright. There are apt to be some hours of half-daylight in the early morning and in the evening, and sometimes whole days of opaque atmosphere, when nothing at a greater distance than a few hundred yards off can be seen through the range-finder at all, although objects 5 miles off are distinctly visible to the naked eye. Unless, therefore, "Black" is furnished with range-finders of quite exceptional light-gathering capacity, he will not be able to employ his fire-control in the early morning and the late evening, or in thick and hazy weather.

Next, it is not easy in rough weather to keep a range-finder continually trained and laid upon a target. It must be mounted in a special manner to render these operations easy and continuous. Again, while "Black" may be trying to maintain a reasonably steady course, it will be impossible for many ships in a line of ships to avoid some helm movements if anything approaching accurate station is to be kept. Should the necessity arise for "Black" to change course, the rear ships of the line will be apt to be

under continuous helm for some minutes before and after the change of course is made. Whatever arrangements, therefore, "Black" employs both for ascertaining the speed and course of the enemy, and for keeping his sights changing in the terms of a forecasted rate, they must be such as will be unaffected by his ships being put under helm. If the rate-keeping device satisfies this condition, there is no reason why being under helm should cause a cessation of fire, for guns can be trained much more rapidly than a ship can be turned. Thus, while "Black" could not hit "White" in the 10-12 minute period there is no reason why "White" should not hit "Black," assuming "Black's" speed and course to be known.

And, lastly, there is a condition the importance of which cannot be overrated. "White's" speed and course having been ascertained, it may easily happen that his ships may be completely concealed from view for periods of a minute or more at a time, either by the smoke of his own guns or by the spray and smoke caused by the bursting of "Black's" projectiles on striking the water: "Black's" arrangements for keeping the rate, therefore, must not be dependent on a continuous supply of "White's" bearings.

In other words, it is indispensable to fire-control, if it is to be battle-worthy, that it should be absolutely accurate in the results it gives; that it should be instantaneous—or, in other words, automatic—in its action; that it should be helm-free, weather-proof, and capable of being used in a half-light. There are, of course, many other conditions that it ought to satisfy. For instance, it must not make too heavy demands either on the numbers or on the skill of the *personnel*. But it would probably be found that if it fulfils the conditions I have enumerated it will necessarily comply with all others that are likely to be raised.

In order to make more clear the bearing of this letter upon warship design the following extracts from communications to the London *Times* are also reproduced:

WARSHIP DESIGN.—The historical survey of progress in naval architecture, and the curiously erratic course which warship design has taken since steel and steam succeeded oak and canvas, have attracted the attention of all who are interested in naval affairs. It has been shown how, by wrong deduction from observed occurrences and faulty reading of the lessons of the sea campaigns of the last 60 years, much ill-directed effort has resulted, and much money has been wasted on vessels unfitted for the kind of warfare which the experience of many years has proved to be the best adapted to the needs of this sea-girt empire. "Success can be attained only by aggressive tactics," and the best possible protection against an enemy's fire is "a well-directed fire from our own guns." Whatever other qualities, then, are given to British ships, the power of taking the offensive, of choosing position, of compelling the enemy to fight when he is at a disadvantage, and the means of delivering a well-directed fire, of hitting every time, and all the time effectively, these are essential. These are the elements to which those who design our ships must give consideration in the largest degree.

Aims of the Dreadnought Policy.—The claim of those who inaugurated what is called the dreadnought policy was that their new types of warships, in a larger measure than had heretofore been the case, embodied the views of naval officers. The ship, it was said, had been fitted to the tactics of the seamen, who no longer would have to fit their tactics to the ship given them by the naval architect. The underlying idea apparently was to give the naval officers the kind of ship which they thought they could make the best use of, and those designs in which were provided to the largest possible extent the elements of battle-worthiness they most desired. Thus in the dreadnought types gun-power and speed, the twin elements of offence, were supplied in larger relative proportion than in earlier ships. Not only did naval officers form the majority of the special committee appointed to consider this question of design, but the instructions to the committee were drawn up by the board after conference and consultation with such experienced flag officers as Sir Arthur Wilson and Lord Charles Beresford.

Moreover, it was claimed by Lord Selborne that the committee had the immediate benefit of the experience to be derived from the naval warfare between Russia and Japan, and the resultant studies of the Naval Intelligence Department.

Needs of Long-range Fighting.—It was clearly indicated that the reason why these naval officers asked for increased gun-power and greater speed was because the Russo-Japanese War had shown that actions were to be fought at a greater range, and that, while the provision of higher-powered guns should permit of the development of effective fire to its furthest extent, increased speed would give the advantage in assuming the offensive and ensure engagements at suitably long ranges. The gun was accepted as the weapon which all history and experience pointed out as that by which decisive naval victories for some three centuries had been won. As weapons influence tactics, so tactics should influence design. Every nation has since followed a similar policy. All the bigger guns in the later ships are of one caliber, while increased speed, with a more numerous battery of long-range heavy ordnance, are the principal elements in all modern battleship designs.

Naturally and necessarily, with the introduction of the dreadnought designs and the inauguration of the dreadnought policy, there came about a renaissance of gunnery methods. The arrival of the long-range-gunned ship and the development of long-range marksmanship were to proceed together. This implied a close connexion between the two; and, indeed, such was the case. It would have been futile to give the ship guns for use at long-range and not to develop methods of hitting at such ranges. It is the number of effective hits made, not the number of rounds fired, that spells victory. As Sir Reginald Custance has said, "It matters little what gun is used if it does not hit."

With the coming of the dreadnought, therefore, an immense improvement in marksmanship took place. The progress in the gunlayers' test—the exercise in which gunlayers showed their aiming skill—was communicated to the public in full detail. The progress in battle practice—the long-range test—was vouched for by the Admiralty, but no details were published. It was presently pointed out that neither practice was a test of battle-worthiness, the conditions were too simple, and their importance seems to have been greatly exaggerated. Certainly, as soon as the target was made to move, the ship to vary her speed and course, and battle practice generally to approximate more closely to battle conditions, the percentage of hits to rounds fell off to an extent which indicated that the real problem of hitting at long ranges had been insufficiently realized. This seems to be clear from the fact that the percentage of hits to rounds, which rose from 18 in 1905 to 30 in 1907, dropped, when the practice was further assimilated to war conditions, to 18 in 1908, and is now said to be down to 13 or lower. Yet the conditions of practice, though increasingly stringent, are still very far from resembling those of actual battle. This it is which is disquieting; since the value of the dreadnought policy, materialized in ship design, must surely be measured by gun efficiency at long ranges.

BATTLESHIP DESIGN.—Naval attention is again directed to this very important theory of battleship design by a letter in *The Times* from the writer of a series of articles on warship design which we lately examined. This certainly able critic now claims to have shown conclusively that: "The great increase in Admiralty expenditure" (*i. e.*, upon construction) "has been, at least in part, due to our own impolicy, that war experience has been too much neglected, and that we are therefore drifting, without guidance or even consistency, towards monstrous ships, costing enormous sums . . . ." and so on. The critic did essay to show all this, but his claim to "conclusive" proof is another story. The theory remains open to debate, and the supporters of Admiral Custance are as yet in the minority. Surely there has been no "inconsistency" in the design of British battleships since the conception of the dreadnoughts? The reten-

tion and the increase of armour may come to be regarded as erroneous policy, but its inconsistency is not apparent. And as for method and principle, our design has unmistakably been influenced by the theory of long-range actions. The purpose of the critic is to induce the Admiralty to apply for a Royal Commission to consider the whole subject of warship design. He thinks that such an inquiry would create public confidence and indicate directions in which "rational economy might be effected." But if the proposed commission concluded that our naval designs have been faulty and unduly costly (as this critic assumes would happen), it is surely the height of inconsistency for him to expect that public confidence in the Admiralty would be strengthened.—*Naval and Military Record.*

DISPOSITION OF SHIPS. CANADA'S NAVY AND AUSTRALIA. THE PROBLEM OF THE PACIFIC.—The *Torch* and *Gayundah* are the only ships at Sydney. The former is refitting alongside Garden Island, and the latter at Cockatoo dock.

The Australian squadron is still at Hobart.

Of the Imperial ships, the *Psyche, Philomel,* and *Pyramus* are at Auckland, and the *Sealark* and *Fantome* at Hobart.

Canada has not asked the advice of Australian opinion upon her naval problem, and unless Australian opinion is sought for in conference or otherwise, neither the government nor the press of this country will attempt the impertinence of tendering it. On the other hand, Australians cannot help reckoning up to themselves what will be the position of this country and of New Zealand in the event of Canada's deciding upon a policy of contribution.

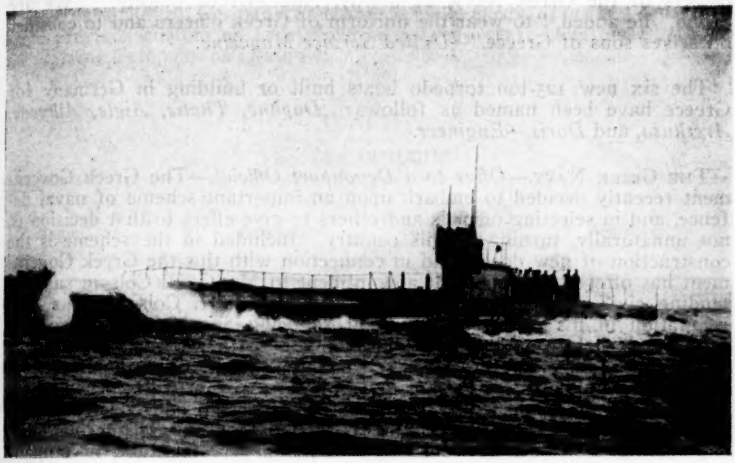
The situation, simply stated, is as follows: The Australian Government has decided that it is necessary for the future of Australasia that a protective fleet should be maintained in the Pacific. Whatever classes of vessels for the time being constitute an effective fleet, of those vessels must the fleet be composed. If the effective fleets of the world were composed of submarines or light cruisers, the fleet in the Pacific would have to be a submarine or cruiser fleet. As every effective fleet at the present moment is a fleet of battleships, of those ships must the fleet in the Pacific be composed. The sole question for Australia is whether an effective British Pacific fleet must or must not exist. That question has been decided once and for all, and quite definitely, by Australian statesmen. They have come to the conclusion that in the interests of Australia an effective Pacific fleet is indispensable. If they had not come to that conclusion, then the presence of the battle-cruiser *Australia* would be not merely unnecessary, but inexcusable—a gross waste of millions of money and of hundreds of men. If the present or any future government believed that an effective British fleet was unnecessary in the Pacific, then it would be their duty to send the *Australia* back to the North Sea, intimate to the Admiralty that Australia would require no effective fleet, and leave the Australian public, when it realized that the sea all around was absolutely bare, to express its opinion at the next general election. As a matter of fact, the historical reason why the *Australia* is in the Pacific is that in 1909 the Australian Government, and (at that time) the British, Canadian, and New Zealand governments also realized that there must shortly be a powerful British fleet in the Pacific; and that it was not too early to set about creating it. It was decided to establish the beginning of that fleet, and the *Australia* and the *New Zealand,* with a similar ship contributed by Britain, were to form what was to be the first battle squadron in that fleet. Since that time Australia and New Zealand have not changed their minds as to the necessity of an effective Pacific fleet, but Great Britain has; and the interest of the Australian and New Zealand peoples in the controversy, which is still unsettled in Canada, lies in the fact that Canada is in effect, if not in intention, at the moment wavering between the British and the Australian view. If, as Mr. Borden is said to have determined at all costs, Canada decided to pay for three battleships built in Great Britain, then the control of those ships

will go to the Admiralty, and they will be stationed, in accordance with the Admiralty's views, at Gibraltar. If, on the other hand, Canada decides on what is miscalled a "local navy," then we shall probably see one or two of the big Canadian ships, at any rate, in the Pacific. If Australasia needs an effective fleet in the Pacific, then the presence of the *Australia* and other big ships in this ocean is essential. But if no other big ships, either British or Canadian, are to be maintained here, and the Pacific is to be abandoned by the navy, and Australian efforts defeated, then the sooner the Australian Government discovers this fact the better. A conference cannot well be held until Canada either suggests one or comes to her decision; for that reason an early settlement of her problem is awaited in Australia with considerable anxiety.—*Naval and Military Record.*

ADVANCE AUSTRALIA!—Criticisms which have been levelled against the government of the commonwealth of Australia respecting the mistake that was made in the vaulting ambition of desiring to build their own cruiser *Brisbane,* before they had assured themselves that their dockyard was sufficiently equipped for that purpose, has tended to becloud the actual naval performances of the Australians, since they started out to provide themselves with a local fleet. This performance is, on the whole, a very creditable one. They have taken over the naval establishment at Sydney, have founded naval training establishments for both officers and men whose work and output have been entirely satisfactory, have now created a fleet of their own, organized and commanded by Rear Admiral Sir George E. Patey, who is in the service of the Australian Government and not controlled by the Admiralty, and who has under his charge a battle-cruiser, the *Australia;* three cruisers, the *Melbourne, Sydney,* and *Brisbane* (the latter still under construction at Sydney dockyard); the *Encounter,* a protected cruiser, six destroyers (two still under construction) each of 700 tons displacement, and two submarines of the *E* class, in a forward state of building. The advance on the personnel side is also excellent; many officers and men have been trained into efficient units of a warship's crew by the four training establishments already mentioned—there has likewise been much surveying work accomplished; moorings have been laid down and a good start made in forming naval bases, which will one day become first-class naval centers. For a young nation, with limited finances, such an effort is most praiseworthy.—*United Service Gazette.*

SUBMARINES FOR AUSTRALIA.—A view of the first of two submarine boats built at Barrow-in-Furness for the Australian Navy the *AE 1,* is reproduced herewith. The view is interesting because of the bow wave due to the peculiar form of the ship forward, which has been designed to make the vessel "dryer" than some of the earlier submarine boats when proceeding awash, a condition which is particularly desirable in the Australian boats, as they will proceed to Australia under their own power. The two vessels are of the *E* class. The length is 176 feet, the beam 22½ feet, and each vessel displaces, when submerged, 800 tons. They are propelled by twin-screws driven, when awash, by heavy-oil engines of the Vickers type, each of which is of 800 brake horse-power, so that the combined brake horse-power is 1600, sufficient to give the vessel a surface speed of 15 knots. When submerged the propellers are worked by electric motors taking current from batteries charged by a dynamo, which can be coupled up to the main propelling engines. The two Australian boats, it may be added, passed through all their trials with thoroughly satisfactory results, and may be said to represent the latest practice in submarine-boat construction. There is a crew of 29 on each vessel. As some evidence of the progress made in recent years in submarine construction, it is worthy of note that when some time ago two submarines were built at Barrow for the Japanese Government, a special steamer was built to carry these two ships to Tokio. Now the Australian submarines are sufficiently powerful and sufficiently

seaworthy to undertake the voyage from England to Australia by means of their own heavy oil engines, which not only work very satisfactorily, but throw off none of the dangerous fumes which, in many instances, have proved so destructive to submarine craft.—*Shipping*, Illustrated.



S. Cribb, Southsea

THE AUSTRALIAN SUBMARINE BOAT "AE 1"

GREECE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battle Cruiser					
Salamis	19,500	23	8 14-in., 12 6-in., 12 3-in.	Hamburg	Laid down July, 1912

NAVAL PROGRAM.—Further reports concerning the program of construction upon which the Greek Navy is to embark were made early in January. It is stated that during the next five years, there will be built two dreadnought cruisers, two other cruisers of 10,000 tons, 25 destroyers, six submarines, 12 gunboats, 20 hydro-aeroplanes, and a depot-ship. This list of ships, published in the Continental Press, is a larger one than that originally issued, in which two battle-cruisers, two cruisers of 5600 tons, four destroyers, six submarines, and ten hydro-aeroplanes, were included. The two battle-cruisers included the *Salamis*, already in hand. It is possible that the purchase by Turkey of the ex-Brazilian battleship *Rio de Janeiro* may have some effect upon the Greek program. Questioned on the subject on January 1, M. Venizelos, the Greek premier, after stating that the present condition of national questions did not allow him to state what orders for ships had already been given, nor what negotiations had been entered into with the object of acquiring others, assured the Chamber that Greece was determined to maintain her supremacy.

THE BRITISH NAVAL INSTRUCTORS.—Writing to the papers on December 27, Rear Admiral Mark Kerr, the senior of the British officers who recently were lent to the Greek Government, said that, the King of Greece having done them the honor of appointing them officers of his navy, they should not be styled members of the British Naval Mission, but British officers of the Greek Navy, or briefly, Anglo-Greek officers. "We are proud," he added, "to wear the uniform of Greek officers and to consider ourselves sons of Greece."—*United Service Magazine.*

The six new 125-ton torpedo boats built or building in Germany for Greece have been named as follows: *Daphne, Thetis, Aigle, Alkyone, Arethusa,* and *Doris.—Engineer.*

THE GREEK NAVY.—*Offer to a Devonport Official.*—The Greek Government recently decided to embark upon an important scheme of naval defence, and in selecting officials and others to give effect to that decision is, not unnaturally, turning to this country. Included in the scheme is the construction of new docks, and in connection with this the Greek Government has offered an important appointment to Mr. C. H. Colson, superintending civil engineer of Devonport dockyard. Mr. Colson has a high reputation in his profession, and before being appointed to Devonport last March, held a similar position at Dover.

In connection with the same scheme, the Greek Government is also asking for candidates for the position of chief assistant-engineer, who have had considerable experience in the control of design and construction of large dock works, workshops, etc., as well as for an assistant-engineer, engineering assistants for drawing-office, and secretary and accountant. —*Naval and Military Record.*

HOLLAND

Holland has five destroyers and five submarines under construction.

SUBMARINE SUNK.—Submarine *No. 5* has sunk at the Scheldt Quay. The vessel is full of water, and a workman, who was the only person on board when the accident occurred, has been drowned. Attempts are now being made to raise her.—*Central News.*

The Dutch submarine *No. 5* is a Whitehead boat of 131 tons displacement.—*Naval and Military Record.*

SOCIALISM IN THE FLEET.—A debate on the navy recently took place in the Dutch Parliament, arising out of the government's proposal to lay down at once the first battleship of the dreadnought type, which is intended for service in the East Indies. This vessel will be of about 21,000 tons, and will carry a powerful armament of 11-inch or 12-inch Krupp guns. A second ship of the same type is also projected, and to supplement the available funds a public subscription has been opened in all the chief towns. No decision regarding the date of commencement appears to have been reached in the Parliamentary debate, as most of the speakers devoted their remarks to the reported spread of socialism in the fleet, and the consequent decline in discipline and efficiency. The Minister of Marine, M. Rambonnet, promised to take the necessary steps to remedy this evil, and he has since issued a general order which forbids the naval personnel to have any dealings with the "Bond Van Minder Marine Personnel" (lower-deck league), a socialist organization which has been particularly active in recent years, and is said to have incited men to commit breaches of discipline and to refuse obedience to their officers. Very severe penalties, including exile, are threatened against Socialist agitators in the fleet.—*Naval and Military Record.*

THE NETHERLANDS.—The naval appropriations for 1914 amount to 44,302,000 Kr., an increase of almost one and one-half millions Kr. for expenses. No new construction is planned, but about six million of the above is to be spent on the ships now under construction of the 1911 program. These are 3 armored cruisers, 8 torpedo craft and 2 submarines with a submarine depot ship. Four of these ships are to be built in the Vulkan dockyards at Stettin, Germany, and four in home yards. This is a departure from previous custom as heretofore all torpedo craft have been built by the Yarrow Company of Glasgow.

ITALY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Cavour.....	22,000	22	13 12-in., 18 4.7-in. 14 14-pdr.	Spezia	Launched Aug. 10, 1911
Leonardo da Vinci	22,000	22	same	Genoa (Odero)	Launched Oct. 14, 1911
Andrea Doria.	22,400	23	13 12-in., 16 6-in.	Spezia	Launched March 30, 1913
Duilio.....	22,400	23	same	Castellamare	" April 24, 1913
Dandolo.....	32,000	23	12 15-in., 16 6-in.	Ansaldo	
Morosini.....	28,000	25	9 15-in.	Odero	
Guiseppe Mazzini	28,000	25	8 15-in., 20 6.in.	Spezia	
Goffredo Mameli	28,000	25	same	Castellamare	Laid down Jan., 1914
Small Cruisers					
Basilicata	2,500	16.5	6 6-in.	Castellamare	Laid down Aug. 9, 1913
Compania	2,500	16.5	6 6-in.	"	" Aug. 9, 1913

NOTE.—Italy has about sixteen destroyers and four submarines under construction.

NEW TYPE OF BATTLESHIP.—According to the *Gazzetta Ufficiale*, one of the super-dreadnoughts to be laid down this year will be named the *Giovanni da Varazzano*, after the reputed discoverer of the Atlantic coastline of the American continent. The new type of battleship, of which this is the first, has been designed by Signor Edgardo Feretti, who since the recent death of Colonel Cumberti, "the father of the dreadnought," is looked upon as the most eminent naval constructor in Italy.

The gun contracts for the new ships have all been awarded. It is understood that the order for 15-inch guns has been equally divided between three firms, viz., Armstrong (Pozzuoli), Vickers (Terni), and Ansaldo. The guns to be made by the two English firms will be of the wire-wound type, while those manufactured by Ansaldo will be built up. It is evident, therefore, that the statement that Italy had decided completely to abandon wire guns was premature.

It is interesting to note that the triple turrets for the 12-inch armament of the *Leonardo da Vinci* were completely built and equipped in England. These turrets were made by Messrs. Vickers at Barrow.—*Naval and Military Record.*

NEW BATTLESHIPS.—It is now definitely reported that the 30,000-ton battleships are to be laid down during the first half of 1914. The designs are not yet complete, but work has been commenced at Spezia to prepare the berth for ship *G*, which will be 692 feet long. Owing to the time which must of necessity elapse before the arsenals can produce the 15-inch guns

required for the armament of these ships, it will be four or five years before the first of the *G* class can be completed. These vessels will carry eight 15-inch guns each.—*Shipbuilder.*

RESULTS OF TRIALS OF DESTROYERS FITTED WITH TOSI TURBINES.—

	Indomito	Intrepido	Irrequieto
Average speed at full power, knots	35.068	35.040	35.796
Power developed in E. H. P.	17.080	17.730	17.640
Maximum speed, knots	35.630	36.740	36.039
Number of revolutions, at average speed with full power	690	692	696
Consumption of naphthaline per H. P. hour at full speed	Average 0.590 kg.		

The time for reversing the engine for a course in the opposite direction at varying speeds of 400, 500 and 600 revolutions at full power was also recorded, and the following are the results:

For passing from "ahead" to "astern," the time was from 9 to 14 seconds, according to the speed of the ship, and for passing from "astern" to "ahead," the time was from 5 to 7 seconds, again according to the speed of the ship.

It was noticed that when passing from full power ahead to full power astern, the latter movement reached a maximum of 400 r. p. m.

On account of the results obtained with the Tosi turbines, the Italian Government, in placing an order with the Odero and Pattison shipbuilding companies for eight new torpedo destroyers of 700 tons, of the *Francesco Nullo* type, specified that these turbines should be utilized as the means of propulsion.

Quite recently the Pattison yard, Naples, gave an order to the latter firm, for eight other turbines, each of 20,000 E. H. P. ahead movement and 6500 E. H. P. astern movement, with 500 revolutions, intended for four destroyers for the Roumanian fleet, of 1500 tons, and a speed of 35 knots.

The weight of each turbine per E. H. P. is from 3.25 kg. to 3.50 kg.

The following are the principal measurements of the Italian torpedo-boat destroyers:

Length, feet	239½
Breadth, feet	23
Average draft, feet	7½
Displacement during trial, tons	612
Displacement fully equipped and manned, tons	620
Maximum speed, knots	35

The principal measurements of the Roumanian destroyers, however, are as follows:

Length, feet	308½
Breadth, feet	30½
Average draft, feet	9¾
Displacement during trial, tons	1,330
Displacement with full equipment and manned, tons	1,450
Maximum speed, knots	35

—*Journal American Society Naval Engineers.*

"SAN GIORGIO."—The Italian armored cruiser *San Giorgio*, escorted by the cruiser *Ferruccio* and a repairing vessel, left Messina for Taranto on December 26, the temporary repairs to her hull having taken somewhat longer time than had been expected. She experienced rough weather on her passage, and only arrived in the small hours of December 28 at her destination, where she has now been dry-docked. The big guns and turrets, which were carried on board the *Bengasi*, have also been disembarked in Taranto Arsenal.—*Engineer.*

"ARETUSA AND CAPRERA."—The torpedo-gunboats *Aretusa* and *Caprera*, both of 850 tons, have been struck off the active list and will be sold, and the gunboat *Governale* is to share the same fate. In her day the *Aretusa* was a remarkably fast little craft. She did 23 knots on trial in 1893. Both the *Aretusa* and *Caprera* were slightly modified editions of the early British torpedo-gunboats, a type which found much favor in Italy at the time.—*Naval and Military Record.*

"ARDENTE."—The destroyer *Ardente*, built by Messrs. Orlando, exceeded her contract speed by 5.3 knots on the trials which took place recently. This vessel is driven by Zoelly turbines.—*Shipbuilding.*

37-KNOT DESTROYERS.—A number of 1000-ton destroyers of a new class are at present being constructed in Italy. The trials of the first of these vessels were made recently, and it is stated that a speed of nearly 37 knots was attained. The Ministry of Marine claims that this destroyer is the fastest boat of its kind in the world.—*Central News.*

"AUDACE."—A very fine performance has recently been achieved by the Italian destroyer *Audace*, of 650 tons displacement. On a four-hour full-power trial carried out in December last the vessel attained a mean speed of 35.5 knots with about 20,000 horse-power, and at one time reached 36.25 knots. The machinery consists of Zoelly turbines driving twin screws, and steam is supplied by White-Forster boilers fired with oil fuel. The sister vessel, *Animoso*, has just completed similar trials with an equally successful result. The armament of these craft consists of one 4.7-inch gun, four 12-pounders, and two torpedo tubes.—*Engineer.*

THE CROWN PRINCE AND THE NAVY.—The Crown Prince of Italy will shortly enter the navy, and will make a lengthy cruise on board the cruiser *Puglia*, which will be commanded by his naval tutor, Capt. Benardi. In the past it has been customary for Italian princes to enter the army on reaching their tenth year, but this departure from tradition has been made at the earnest wish of the Crown Prince himself, who already shows great enthusiasm for the sea service.—*Naval and Military Record.*

"TWELVE SUPER-DREADNOUGHTS BY 1918."—COST OF THE WAR.—The German paper *Schiffbau* reports that the Italian Government intend to bring forward a new naval program very shortly which will provide for the construction of 12 super-dreadnoughts by 1918, each of these ships to be armed with ten 15-inch and twelve or fourteen 7.5-inch guns. The heavy weapons will be mounted in double turrets. Contracts for the first units of this class have already been placed with home yards, and the first is to be laid down at Spezia. The displacement will be 28,000 tons. This new Italian program is to be regarded as a reply to the French scheme, which will give France by 1918 a force of 38 battleships, including 20 dreadnoughts, all the 18 pre-dreadnoughts carrying guns of 12-inch. No authority is cited for the foregoing statement, but it should be noted that the German press is constantly crediting Italy with gigantic building programs which never seem to materialize.

During her speed trials outside Spezia lately the new destroyer *Audace* reached a maximum speed of 36.2 knots, developing 20,000 horse-power, whereas the contract only called for 15,000 horse-power. The *Audace* is one of four 690-ton destroyers built by Orlando, and is of the same type as the six boats of the *Impavido* class recently completed by Pattison. All these boats burn oil only.

The new submarine *Giacinto Pullino* has made her contract surface speed of 18 knots on trial, and is therefore probably the fastest submarine in the world. On the other hand, she is reported to have failed to reach the speed of 14 knots submerged, which the contract calls for. The builders are the Fiat San Giorgio.

The harbor of Taranto is being made into a naval base of the first class, and the fleet station at Naples has already been transferred to the first-named port.

Interesting figures have been published relating to the late war with Turkey. The total cost of the conquest of Libia amounted to £39,000,000. During 1911 no fewer than 90,000 men were despatched thither, followed in 1912 by a further 124,000, while 70,000 men were withdrawn. Thus the conquest of the country demanded an army of 114,000 men. The Italian casualties throughout the war amounted to 236 officers and 4076 men killed or wounded.

THE BALANCE OF POWER IN THE MEDITERRANEAN.—*The Italia Marittima* prints an article dealing with Austria-Hungary's intention to postpone the building of four dreadnoughts, and says that this delay will have no influence on Italian construction. The strength of the Austrian fleet is no longer responsible for Italian naval expansion, for Italy has now to reckon with the balance of power in the Mediterranean in general. The need of securing the safety of the new African possessions impels Italy to add to her naval force. She is accordingly building four dreadnoughts, to be completed by 1916, and from then on one ship will be laid down each year, so that by 1921 the fleet will include 21 battleships. The design of the four new dreadnoughts has now been finally determined. They will be 656 feet long and 98 feet in beam. The keels will be laid shortly, and all four ships are expected to be completed within 32 months. This is, however, at variance with earlier reports, according to which the building period will be not less than four years owing to unavoidable delays in the manufacture of guns and armor.

The Italian Admiralty is experimenting with a new steam turbine of Italian origin. The tests are being made in the harbor of Spezia, and have proved most satisfactory. The special advantages of the new turbine are claimed to be: Very moderate steam consumption at all speeds, but particularly at cruising speed, strong construction, and easy maneuvering. The inventor is Professor Belluzzo, of the Milan Polytechnic.—*Naval and Military Record.*

JAPAN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Fuso	31,300	22.5	12 14-in., 16 6-in.	Kure	Launched Mar., 1914 (?)
Fuso 2d	31,300	22.5	....	Kawasaki	" May, 1913
Fuso 3d	31,300	22.5	....	Mitsubishi	" Feb., 1914
Fuso 4th	31,300	22.5	....	Yokosuka	.....
Battle-Cruisers					
Hiyei	27,940	27	8 14-in., 16 6-in., 8 t. t.	Yokosuka	Launched Nov. 21, 1912
Haruna	27,940	27	same	Nagasaki	" Dec. 14, 1913
Kirishima	27,940	27	same	Kobe	" Dec. 1, 1913

NOTE.—Japan has two destroyers and two submarines under construction in England and France respectively.

"KONGO."—The Japanese battle-cruiser *Kongo* has become flagship of Vice Admiral Kato Yusaburo, commanding the first squadron of the Japanese fleet. The other vessels in this force are the dreadnought battleship *Settsu*, the "mixed armament dreadnought" *Satsuma*, the pre-dread-

nought battleships *Suwo* and *Iwami*, and the armored cruiser *Tsukuba*. The second squadron, consisting of the armored cruisers *Yakumo* and *Iwate* and the protected cruisers *Hirado* and *Chikuma*, is commanded by Vice Admiral Kato Seikichi.—*United Service Magazine.*

RETIRING AGE CHANGES.—Dating from March 31 next the compulsory retiring ages of flag officers on the active list of the Japanese Navy will be modified as follows: Admirals will retire at 65 instead of 68; vice admirals at 60 instead of 63; and rear admirals at 56 instead of 58. It will be seen that the new rates are lower than those ruling in the British service to the extent of five years for vice and four for rear admirals. Captains are to retire at 52, commanders at 48, senior lieutenants at 45, and junior lieutenants at 43.—*United Service Magazine.*

JAPANESE INSTITUTION OF NAVAL ARCHITECTS.—The Japanese Institution of Naval Architects carried out last November a more ambitious program than on any previous occasion. Their meetings were spread over four days, November 14 to 17, and the program included ten papers, a dinner, and excursions. Sir P. Watts was expected to be present, both at the papers and at the dinner, but was recalled to England a few days prior to the meetings. The principal excursion was that made to Yokosuka, to visit and make careful examination of H. I. M. battle-cruiser *Kongo*, recently arrived from Vickers' works in England, after a most successful voyage by the Cape of Good Hope.

The full list of papers read was as follows:

"On the Use of Special Steel in Warships," by Commander Y. Hiraga, Naval Constructor at Yokosuka.

"On Some Experiments on Mild Steel and Special Steel Rivets," by Commander Hiraga and Lieutenant Hashiguchi.

"On Recent Studies in Connection with Rivets, Riveting and Riveted Joints," by Lieutenant Y. Taji, Assistant Naval Constructor.

"On Rolling, and Anti-Rolling Tanks," by Dr. Suyehiro, Professor of Naval Architecture, Tokyo Imperial University.

"On Water-Tube Boilers for Marine Purposes," by Mr. M. Miki, engine-shop manager of the Mitsu Bishi works at Kobe.

"On the Construction of Ships with Flanged Plates," by Mr. K. Ota, Surveyor to the Mercantile Marine Bureau, Department of Communications.

"On the Preservation of Timber and on Bottom Painting," by Dr. T. Shiga.

"On the National Flag and its Use in Ships," by Mr. N. Matsunami.

"On Vibrations of Ships and Instruments to Measure them"; also "On a Rollingless, Pitchingless, and Waveless Ship," both by Dr. Y. Yokota, Professor of Naval Architecture, Tokyo Imperial University.

From Professor F. P. Purvis, of the Tokyo Imperial University, we have received the following account of the proceedings:

Japanese Naval Progress.—In the unavoidable absence of Baron Akamatsu, the president, the chair at all the meetings was taken by Dr. S. Terano, Professor of Naval Architecture, Tokyo Imperial University. In the course of the president's address, read by the chairman, reference was made, with some pride and decided approval, to Japan's forward policy in regard to both the army and navy. Dealing wholly with the latter, it pointed out that "the battle-cruiser *Kongo* has already arrived from Vickers' Works, Barrow-in-Furness, and the sister ships *Kirishima* and *Haruna* are on the eve of being launched, while the *Hiyei* is approaching completion. The *Fuso*, the most powerful warship in existence, is to take the water early next spring. The day is at hand when great strength will be added to the Imperial Navy." In speaking of the mercantile marine, the address pointed with gratification to the work of the year completed in the home shipyards, instancing the *Kashima Maru* and *Katori Maru*, built for the Nippon Yusen Kwaisha's London service, and the *Anyo Maru*,

built for the South American service of Toyo Kisen Kwaisha, the largest geared turbine vessel at present afloat. "The total number of ships launched this year (in Japan), war and mercantile, is over 190; tonnage, 120,000; while under construction are four *Fusos*, and some twenty steamers ranging from 1000 to 12,000 tons; the total tonnage in hand exceeds 220,000 tons, breaking all records. On the other hand, during the past three years, a number of ships have been imported to meet our unprecedented activity of sea commerce; these aggregate 140 in number and 430,000 in tons, all bought from abroad. Of these, seventeen ships, of 70,000 tons, are newly built. Thus in spite of government protection we still seek the assistance of foreign builders for the supply of our new ships. The need for this state of matters, and the causes leading up to it, are at present under the consideration of a committee formed in the early part of the year. It is much to be hoped that the outcome of this committee's investigations will be favorable to the development of the shipbuilding industry within the country."—*Engineering*.

On November 20 last the construction of the fourth ship of the *Fuso* class was started. This ship, of a tonnage of 30,600, will have a main battery of twelve 35.6-cm. guns (according to other reports ten 38-cm.) and a torpedo defence battery of sixteen 15-cm. quick-firers; speed 22.5 knots. When this ship is launched Japan will have twelve dreadnoughts completed. The Japanese fleet includes the eight battleships of the *Satsuma* and *Kawochi* classes now in commission; the battle-cruiser *Kongo* and her three sister ships, and the Yokosuka built battleship *Hiyei* which should be finished some time this spring.

We are informed by London dispatches that Japan intends to order from an English firm a second battle-cruiser of the *Kongo* type.

The delayed launching of the battleship *Fuso* took place in February. The *Marine Rundschau* gives the following data for the *Fuso:* Turbines, Parsons, 45,000 horse-power, four propellers, twelve 35.6 cm. and sixteen 15.2-cm. guns.

Several powder explosions have taken place in Japan lately; July 16 two workmen were killed and several injured at Kure (ammunition case exploded); August 10, 150 tons of powder exploded at Meizurn (?); and on August 21 on board the *Musachi* a 6-pounder cartridge burst, killing two men; again on August 27 a large quantity of powder exploded in the open air at Kure dockyard.—*Mitt. aus dem Geb. des Seew.*, translated by Lieut. C. B. Mayo, U. S. Navy.

NORWAY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Small Cruisers					
Bjorgvin	5000	16.5	2 9.4-in.	Messrs. Armstrong	Laid down Jan. 8, 1913.
Nidaros	5000	16.5	2 9.4-in.	same	.....

NOTE.—Norway has four submarines under construction.

ROUMANIA

According to the Berlin correspondent of *The Journal des Debates*, Roumania intends to purchase two armored cruisers, in addition to the torpedo-boats already ordered in Italy, in order that she may have a fleet

adequate for the protection of the country's new coastline. The two armored ships are said to have been ordered in Germany for delivery next autumn.

The Roumanian building program calls for an expenditure of 142,000,000 Kr. to be extended over a period of eight years and contemplates the following addition to the navy:

For the Black Sea fleet, six small cruisers of 3500 tons displacement and 12 destroyers of 1500 (?) tons displacement. For the Donau (Danube) flotilla, 12 monitors of 600 tons and a number of smaller craft.

Four of the destroyers are now being built at Pattison's in Naples. Four of the monitors were launched in 1907 and 1908.—*Mitt. aus dem Geb. des Seew.*

RUSSIA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Sevastopol	23,300	23	12 12-in., 20 4.7-in.	Baltic Works	Launched June 29, 1911
Petropavlovsk.	23,300	23	same	" "	" Sept. 9, 1911
Poltava.....	23,300	23	same	New Admiralty	" July 10, 1911
Gangut	23,300	23	same	" "	" Oct. 7, 1911
Emperor Alexander III	21,000	21	same	Nikolaieff	" July 24, 1912
Empress Marie	21,000	21	same	Ivan Bunge Co.	" Nov. 1, 1913
Catherine II...	21,000	21	same	" " "	Laid down Sept. 1, 1912
Battle Cruisers					
Ismailia.....	28,000	27	9 14-in., 20 4.7-in.	Galerni	" Dec. 20, 1912
Kinburn.....	28,000	27	same	Baltic Works	same
Borodino.....	28,000	27	same	Galerni	same
Navarino.....	28,000	27	same	Baltic Works	same
Small Cruisers					
Adm. Butakow	7,000	..	.....	Putilow, St. Petersb.	Laid down Nov. 29, 1913
Adm. Epiridow	7,000	..	.....	" "	" Nov. 29, 1913
Evjatlana	7,000	..	.....	Neval	" Dec. 7, 1913
Adm. Creigh ..	7,000	..	.....	"	" Dec. 7, 1913
Muravjev Amurski	4,500	..	.....	Elbing	" Sept. 22, 1913
Nevelskoj	4,500	..	.....	"	" Sept. 22, 1913
Adm. Laserew.	7,000	..	.....	N. F. & W. Nikolaieff	" Nov. 1, 1913
" Nachimow	7,000	..	.....	R. S. Co. "	" Nov. 1, 1913

NOTE.—Russia has about 30 destroyers and 25 submarines under construction.

The Russian Minister of Marine has ordered to be registered in the list of vessels under construction six cruisers, four named after Admirals Boutakoff, Spirvoff, Greig, and Nevelskvi, 36 torpedo-boat destroyers, and 12 submarines.—*Naval and Military Record.*

Naval court martial has sentenced Captain Berch to be dismissed from the service, and Steersman Gorbuzky to three months imprisonment, in connection with the accident to the gunboat *Uralets.—Naval and Military Record.*

SPAIN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Espana.....	15,700	..	.....	Ferrol	Trials begun Aug., 1913
Alfonso XIII..	15,700	..	.....	"	Launched May 7, 1913
Jaime I.....	15,700	..	.....	"	Laid down Feb. 5, 1912

SWEDEN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Small Cruiser					
Sverige.....	6800	..	.....	Gothenburg	Laid down Feb. 15, 1913

The battleship *Sverige* will be fitted for oil burning.

The raising of the gun-boat *Urd* which was sunk by collision with the armored cruiser *Oden* at her launching last August, has been let to a private wrecking company.

A new floating drydock will be built in Gothenburg by a private company, lifting capacity 10,000 tons, beam 25 meters. The dock will be divided into several independent sections so that smaller craft may be docked economically.

THE NATION AND THE NAVY.—The Parliamentary dispute in Sweden hinges on the question of the navy. As far as can be judged, an overwhelming majority of the nation desires to see the fleet strengthened, and is perfectly willing to bear heavy taxation for this purpose. The ministry, on the other hand, refuses to concede the necessity of naval reinforcement on a large scale, and has brought in a scheme for adding to the army at the expense of the naval defences. The resignation of the cabinet, which has recently taken place, is believed to foreshadow a progressive naval policy, as the new prime minister is well known as an enthusiast for the fleet.

Although the population of Sweden does not exceed five and a half millions, a popular fund inaugurated a year or two ago produced no less a sum than £850,000 to be devoted to the navy. Out of this money the battleship *Sverige* is building, and the surplus is being devoted to submarine construction.

The present popular agitation for a stronger navy is due to the revelations made subsequent to the last naval maneuvers, which are said to have demonstrated the uselessness of four out of the 12 coast-defence ironclads. The four ships in question, *Oden*, *Thule*, *Göta*, and *Svea*, are old, poorly armed, and very slow. In anything like a seaway they are said to be absolutely helpless, as they can neither fight their guns nor maintain steerage way. After the maneuvers the commander-in-chief strongly recommended the government to scrap at least two of these ships, but for political reasons they are still kept on the active list, and the Swedish fleet is thus made to look considerably more imposing than it actually is.

At present there is only one vessel, excluding torpedo craft, in the fleet which can steam at more than 19 knots, this being the cruiser *Fylgia*. In order to have at its disposal several fast ships in time of war, the government is negotiating with the America-Swedish Steamship Line. A yearly subsidy of £25,000 will probably be paid to this company in consideration of its placing its 21-knot steamers at the disposal of the authorities to serve as auxiliary cruisers.—*Naval and Military Record.*

TURKEY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleship					
Reschadieh....	23,500	..	.....	Vickers, Barrow	Launched Sept. 3, 1913

TURKEY AND HER SUPER-DREADNOUGHT.—In August last, when Sir Edward Grey made his famous speech in the House of Commons, in which he summed up, as Chairman of the European Conference, the proceedings of the previous months in connection with the late war, it was remarked that his references to the Ægean Isles left that question unsettled, the decision reached being the purely negative one that they should not be annexed by any of the great powers. It is noteworthy also that in all the negotiations and discussions preceding and following the drawing up of the tentative agreement with Greece, any proposals affecting the future status of the islands have been studiously omitted, Turkey professing to desire that the question should be left to the decision of the powers. It was pointed out at the time that the omission to settle this point finally was likely to affect the permanency of the peace agreement, and that Turkey evidently intended, at a suitable opportunity, to press for a direct settlement with Greece on this vexed subject. A month or two later the possibility of the Turks buying the Brazilian super-dreadnought *Rio de Janeiro* was openly debated, and it is known that an offer was made by Turkey to exchange the less powerful *Reschadieh* for the 20,000-ton *Rio;* other offers were made, but Brazil stood out for cash. It is now announced that the purchase has been completed, and a delicate situation has been created in view of the growing tension between Turkey and Greece on the subject of the islands. The secrecy which has been observed in connection with the purchase, and the dragging out of the Greco-Turkish negotiations, seem to justify to some extent the uneasiness in Europe, and the misgiving which the new turn of affairs has caused. What effect this incident will have on the question of the assignment of the islands, the consideration of which, by the powers, is still proceeding, remains to be seen; but apart from these questions it is curious to note, in connection with the ramifications of the armament interests of which so much has been heard lately, that a huge battleship, built in a British shipyard to the order of Brazil, can be paid for by French money and handed over to Turkey. —*United Service Gazette.*

Raouf Bey, commander of the Turkish warship *Hamidieh*, who played the chief part in the negotiations for the transfer to the Ottoman Government of the Brazilian battleship *Rio de Janeiro*, has returned to London. His presence in town is understood to be connected with the possible Turkish acquisition of another battleship now being built in the same yard. —*Naval and Military Record.*

TURKO-GRECIAN RIVALRY.—Turkey and Greece are each trying to outdo the other in the rapid growth of their navies. Greece allows in her new naval program, which is to be completed within five years, for two battle-cruisers of the dreadnought type, two armored cruisers of 10,000 tons each, 25 destroyers, six submarines, 12 gunboats and 20 seaplanes with a mother ship. Greece will have to float a foreign loan of £12,000,000 to complete her ambitious program, which would place her in the rank of fourth strongest naval power in the Mediterranean.—*Engineer.*

LOAN OF BRITISH NAVAL PENSIONERS APPROVED.—It is officially announced that the Admiralty have approved of certain naval pensioner ratings being lent for service under the Turkish Government. A list of the ratings required and the terms offered to each are given below. The pensions of men selected for this service will be paid to them during their absence from England, unless they elect to take the higher rates of pay offered by the Turkish Government, in which case the payment of pensions will be suspended. Men belonging to the Royal Fleet Reserve will be required to take their discharge from the Reserve on accepting service under the Turkish Government, but they will be allowed to re-enrol on returning to England if they could do so in time to enable them to requalify for the Royal Fleet Reserve age pension. Volunteers for these appointments should forward their names to the Commodores of Depôts.

The following is a list of ratings required and the terms offered: One chief, first, or second writer, to be selected by the naval adviser as an addition to his present staff. Salary, Ltq 220.

One pensioned chief armorer to act as naval ordnance artificer for the fleet and establishments. Salary, Ltq 240 per annum. To be selected by Admiral Limpus. Travelling expenses for this man to be Ltq 40 for himself and his wife and family.

Instructors for the naval barracks.—Two pensioned gunnery instructors; salary, each Ltq 220 per annum. One pensioned torpedo instructor; salary, Ltq 220 per annum. One pensioned armorer; salary, Ltq 204 per annum. Two pensioned chief stokers; salary, each Ltq 220 per annum.

Instructors for the cruising training ship *Messudieh.*—Two pensioned gunnery instructors; salary, each Ltq 220 per annum. One pensioned torpedo instructor or torpedo gunner's mate; salary, Ltq 220 per annum. One pensioned P. O. telegraphist; salary, Ltq 204 per annum. One pensioned armorer; salary, Ltq 204 per annum. One pensioned diving instructor; salary, Ltq 204 per annum. Two pensioned chief stokers; salary, each, Ltq 204 per annum. Two pensioned engine-room artificers or chief engine-room artificers; salary, each, Ltq 240 per annum. One pensioned blacksmith; salary, Ltq 204 per annum; this man will supervise the training for chain cables, capstans, and fire mains. One pensioned shipwright; salary, Ltq 204. The above rates of pay for pensioned petty officers are assessed on the supposition that the men will not be allowed to draw their English pensions while serving in Turkey. In the event of their being allowed to draw their English pension the rate of pay should be reduced—the chief armorer drawing Ltq 30 less, and each of the others Ltq 20 less, per annum. All these persons will have their passage paid once out and once home again at the rate of Ltq 30 each for the officers and Ltq 20 each for the foreman and petty officers, except for the chief armorer, who will be granted Ltq 40. The petty officers shall also be given a grant of Ltq 5 each to provide them at starting with Turkish naval uniform. Period of engagement under the Turkish Government, two years.

THE TURK RAMPANT.—It looks as if the young Turks were bent on another effort to establish their rule by conquest. The amazing chances of a war in which they took no part enabled them to recover Adrianople and a substantial part—strategically important—of the territory lost to the allies. The still more amazing chances of intricate Balkan diplomacy have, it would seem, enabled them to make an ally of Bulgaria, their chief foe in

the earlier struggle, and they are reported to be planning aggression toward Greece. In this project they have two objectives, one to seize the islands of the Ægean nearest the Dardanelles, the other to recover Salonika and the region east of that city. Incidentally, they are said to look forward to establishing a claim in Albania. To these schemes the passive, if not active, aid of Bulgaria is needful, and is reported to be secured. The chief advantage to the Turks would be the passage of their troops through Bulgarian territory.

But there are serious obstacles in the way of this ambitious program. It obviously threatens to involve directly the essential interests of the great powers. The seizure of the Ægean Islands would be a flagrant violation of the agreement to which all the powers are committed. War upon Greece on land would raise the questions involved in the settlement of the second and latest Balkan contest, and especially would directly affect Rumania and Russia. If Bulgaria should yield passage to Turkish troops across her newly acquired territory she would have to risk a joint movement of Rumanian and Servian troops upon her own capital—a repetition of the situation of last autumn, which was so nearly fatal to her. The recapture of Salonika and the Ægean Islands would open up again the vexed question of Italian claims as against Austria. Both Great Britain and France would resist the overthrow of the balance attained in the Adriatic, the Aegean, and the Mediterranean. Under these conditions it is reasonable to infer that the Turko-Bulgarian scheme, so widely announced and discussed, is rather a move in the game of diplomacy than a seriously developed policy.—*New York Times.*

TURKEY'S MILITARY POWER.—The appointment of Enver Pasha to the Ministry of War at Stambul, may or may not be a strengthening of Turkey's military power. If he consolidates the Ottoman forces in Anatolia, and adopts a reasonable attitude in the Ægean Islands question, he will help his country. If the new War Minister makes a great *tête-te-pont* of Adrianople and pours soldiers into the new lines, he will in reality weaken Turkey's position. Izzet Pasha has resigned, Enver's appointment is interpreted to mean a firm attitude on the question of the islands, and therefore a possible war with Greece at no very distant date. Our readers will remember Enver Pasha's career; his gallant fights in Tripoli against Italy, and against the victorious Bulgarians in Europe command admiration. His attitude caused suspicion at the time of the *coup-d'état* in January, 1913, when Nazim Pasha, Great Britain's friend, was brutally murdered in his own ministerial dwelling. It is said that the new Minister of War will effectively co-operate with Von Sanders Pasha, the new commander of the first army corps, in strengthening the Dardanelles defences. Djemal Bey is promoted to the rank of brigadier-general with the title of Pasha. A ministry that contains Djemal Pasha, Talaat Bey, and Djavid Bey is, as the *Temps* says, a Cabinet which will make the Sultan, the Grand Vizier, and Turkey do as it pleases.—*Army and Navy Gazette.*

THE ÆGEAN ISLANDS.—Turkey has thrown off the mask. The recently appointed Ottoman Minister in Athens, Ghalib Bey, has, according to the *Embros,* a paper that has a reputation for truth, stated plainly that if Greece desires peace with Turkey (*sic*) she will have to surrender Chios and Mytilene; if not, "Turkey will have to take them," as she considers their retention by Greece to be a danger to Anatolia. According to the argument of the danger on account of proximity, Tenedos, Samos, and Kos are just as much a "danger to Anatolia" as Chios and Mytilene. The minister is reported to have added that if Greece continued to keep the last-mentioned islands the Turks would harass the Greek population inhabiting the Turkish coastlands on the Ægean Sea. He also said that it was hopeless for Greece to try to compete with Turkey for the naval command of that sea. The Greek Minister of Foreign Affairs, M. Streit, professes to regard these ominous words as merely the expression of Ghalib

Bey's private opinion, but he must know, unless he be singularly misinformed, that they represent the decision of the Committee of Union and Progress, in other words of the ruling power in Turkey, and, moreover, that Ghalib Bey is giving voice to the determination of the Porte not to rest till it has recovered possession of the Ægean Islands, which she considers necessary for her safety.—*Army and Navy Gazette.*

UNITED STATES

VESSELS BUILDING

Number	Name	Displacement	Speed	Armament	Where Building	Remarks
	Battleships					
34	New York....	27,000	21	10 14-in., 21 5-in., 4 t. t.	N. Y. Navy Yard	Launched Oct. 30, '12
36	Nevada.....	27,500	20.5	same	Quincy	Laid Down Oct. 26, '12
37	Oklahoma....	27,500	20.5	same	Camden	" " Nov. 4, '12
38	Pennsylvania	31,400	21	12 14-in., 22 5-in., 4 t. t.	Newport News	" " May —, '12
39	....	31,400	21	same	N. Y. Navy Yard	....

RUMORS OF WARSHIP PLANS.—It has been reported that the Construction Bureau of the United States Navy has in preparation plans for a superdreadnought which, it is claimed, will be the largest and most powerful warship designed. Her main dimensions are said to be: Length, 750 feet; breadth, 100 feet; draft, 28 feet 6 inches; displacement, 38,600 tons. The armament will consist of twelve 14-inch guns and twenty-one 6-inch guns, the belt armor will have a thickness of 17 inches, and the barbette armor of 16 inches. The estimated total cost of the vessel is £4,200,000. The vessel cannot progress beyond the designing stage at the present time, as no appropriation has yet been made by Congress.—*Engineer.*

A COMPARISON OF BRITISH AND AMERICAN BATTLESHIPS.—In a letter addressed to the *Scientific American* the writer draws a comparison between the British 25-knot battleships of the *Queen Elizabeth* class and our own latest battleships. He claims that, because the armor of the British ship is thicker (though there is some doubt as to this) the principal gun heavier, and the speed greater, therefore the *Queen Elizabeth* must be a more effective ship than our *Nevada* or *Pennsylvania.*

Now the displacement of the *Queen Elizabeth* and the *Nevada* is given as about the same. But this means that when the English ship is loaded with the same proportion of her total amount of ammunition, fuel, stores, etc., as the *Nevada,* she will be of considerably greater displacement; for the English displacement, as given in published statements, represents the weight of the ship, not when she is in fighting condition, as it does in the case of the ships of our navy, but when she has only a limited portion of her fuel and stores aboard.

Now as to the superiority. The English 15-inch gun is of one inch larger caliber than the 14-inch gun carried by the *Nevada.* But our correspondent does not know, probably, that the muzzle velocity of the English gun is considerably lower than that of our 14-inch gun; that the energy is not very much greater; and that the penetration at the probable battle range of ten thousand yards is about the same, although the bursting charge of the 15-inch gun, of course, is considerably larger. Furthermore, he omits to

NAVY DEPARTMENT
BUREAU OF CONSTRUCTION AND REPAIR
VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY, MARCH 10, 1914

	Name, type and no. of vessels	Contractor	Per cent of completion			
			Mar. 1, 1914		Feb. 1, 1914	
			Total	Per cent on ship	Total	Per cent on ship
	Battleships					
34	New York	New York Navy Yard	98.1	97.9	96.4	96.0
35	Texas	Newport News S. B. Co.	99.0	99.0	98.3	98.3
36	Nevada	Fore River S. B. Co.	57.8	42.8	55.2	39.6
37	Oklahoma	New York S. B. Co.	63.2	58.9	60.8	55.9
38	Pennsylvania	Newport News S. B. Co.	19.5	12.3	17.0	10.1
39	.....	New York Navy Yard	7.4	.....	4.7	.....
	Destroyers					
45	Downes	New York S. B. Co.	94.5	94.5	93.7	93.7
50	Balch	Wm. Cramp & Sons.	97.3	97.3	92.6	92.4
51	O'Brien	Wm. Cramp & Sons.	46.6	41.5	42.1	36.4
52	Nicholson	Wm. Cramp & Sons.	45.2	39.7	42.1	36.3
53	Winslow	Wm. Cramp & Sons.	44.0	38.8	40.3	34.6
54	McDougal	Bath Iron Works	75.7	74.2	66.6	64.5
55	Cushing	Fore River S. B. Co.	35.1	29.6	32.0	26.7
56	Ericsson	New York S. B. Co.	49.8	46.6	40.9	38.3
57	.....	Fore River S. B. Co.	7.6	.....	6.8	.....
58	.....	Wm. Cramp & Sons.	4.4	.....	2.6	.....
59	.....	Wm. Cramp & Sons.	4.3	.....	2.5	.....
60	.....	Bath Iron Works.	10.3	.....	7.2	.....
61	.....	New York S. B. Co.	9.3	.....	8.9	.....
62	.....	New York S. B. Co.	9.3	.....	8.9	.....
	Destroyer Tenders					
2	Melville	New York S. B. Co.	36.5	34.4	29.6	26.5
	Submarines					
26	G-4†	American Laurenti Co. (Phila.)	96.4	95.5	96.4	95.5
27	G-2*	Lake T. B. Co. (Bridgeport).	89.7	89.7	89.7	89.7
31	G-3*	Lake T. B. Co. (Bridgeport)	81.4	81.1	80.3	80.0
32	K-1	Electric Boat Co. (Quincy)	99.2	99.2	99.2	99.2
33	K-3	Electric Boat Co. (San Fran.)	92.4	92.1	91.7	91.0
35	K-4	Electric Boat Co. (Seattle)	91.7	90.9	89.4	88.7
36	K-5	Electric Boat Co. (Quincy)	89.8	89.8	88.9	88.9
37	K-6	Electric Boat Co. (Quincy)	89.8	89.8	88.7	88.7
38	K-7	Electric Boat Co. (San Fran.)	85.3	84.0	83.6	82.1
39	K-8	Electric Boat Co. (San Fran.)	84.9	83.6	83.0	81.5
40	L-1	Electric Boat Co. (Quincy)	22.8	19.0	22.8	19.0
41	L-2	Electric Boat Co. (Quincy)	22.5	18.7	22.5	18.7
42	L-3	Electric Boat Co. (Quincy)	22.5	18.7	22.5	18.7
43	L-4	Electric Boat Co. (Quincy)	22.4	18.6	22.4	18.6
44	L-5	Lake T. B. Co. (Bridgeport)	7.4	4.2	7.4	4.2
45	L-6	Lake T. B. Co. (Long Beach, Cal.)	0.0	0.0	0.0	0.0
46	L-7	Lake T. B. Co. (Long Beach, Cal.)	0.0	0.0	0.0	0.0
47	M-1	Electric Boat Co. (Quincy)	14.1	10.3	14.1	10.3
	Submarine Tenders					
1	Fulton	New London S. & E. B. Co. (Quincy)	45.0	40.4	39.1	33.2
2	Bushnell	Seattle Construction & D. D. Co.	23.2	.....	20.9	.....
	Fuel Ships					
13	Kanawha	Mare Island Navy Yard	37.3	33.6	31.5	27.3
14	Maumee	Mare Island Navy Yard	20.5	14.4	17.5	11.3
	Miscellaneous					
G. B. 19	Sacramento	Wm. Cramp & Sons.	86.7	84.2	78.6	75.8
Supply Ship No. 1	....	Boston Navy Yard	0.0	.....	.....	.....
Transport No. 1	.....	Phila. Navy Yard	0.0	.....	.....	.....

*Contracts forfeited, vessels being completed New York Yard.
†Conditionally delivered at Phila. Yard, Jan. 22, 1914.

state that the *Nevada* carries ten 14-inch guns as against eight 15-inch guns carried by the *Queen Elizabeth*. Also, there is reason to believe that the fuel supply of the *Nevada* is greater than that of the *Queen Elizabeth*, that is to say, that she could keep the sea longer without calling up the colliers or returning to a coaling station. And, yet again, any one who is familiar, even in a general way, with naval design, knows that the extra weight put into machinery to secure 25 knots as against 21 knots is so great that some other important military element in the ship, such, for instance, as the internal subdivision as a defence against torpedo attack, which in our ships is most elaborately worked out, and is probably more complete than it is in the British ships, must have been sacrificed in favor of boilers and engines.

It is an accepted principle of the tactics of a line-of-battle engagement, that the fleet must be kept together as one unit, the speed of the faster ships being accommodated to that of the slower, so that the latter be not left behind to be cut off and sunk in detail by the enemy. The average speed of the British fleet, like that of our own, is about 21 knots; or, say, 18 to 20 knots in an actual engagement. If the British 25-knot *Elizabeths* are to lie in line with the rest of the fleet, they must not use their highest speed, but must carry within their hulls hundreds of tons of motive power, which they may never be called upon to use throughout the whole engagement.

The British naval staff, in designing these five remarkable ships, has, no doubt, assigned to them some definite work in the strategy and tactics of the various war plans which it is the duty of the staff to formulate and work out. In the absence of knowledge of what these plans are, the ships look to be an odd size—too fast for the first line of battle; too slow for the 28-knot battle-cruiser class.

AWARD OF SUBMARINES.—The Secretary of the Navy has decided upon the award of three submarines authorized by act of Congress approved March 4, 1913. Bids were opened for these submarines December 2, 1913, but the decision as to award of contracts has been delayed, owing, in part, to the financial state of one of the companies bidding. The Secretary has decided upon the following awards: To the Electric Boat Co., two submarines of their type 37-H, to be built at the works of the Fore River Shipbuilding Corporation. One boat of the Lake Torpedo Boat Co.'s type, to be built in a navy yard; complete detail working plans for this boat and license to construct are to be furnished by the Lake Torpedo Boat Co. The navy yard at which the vessel will be built has not yet been decided upon. The contract for the other submarine has not yet been awarded.

Considerable interest attaches to some experiments which are being conducted at the Washington navy yard looking to the development of a new shell of the open-hearth type. These are of 12-inch caliber, and some expectation is entertained concerning the success of the project. The shell when completed will be tested at the Indian Head proving ground, and upon the results will determine whether the navy ordnance bureau is in a position to undertake the manufacture of these projectiles. In that event, it is anticipated there will be no difficulty in obtaining appropriation for the installation of the necessary facilities of manufacture. The bureau has also recently devised a floating mine, which costs about $75, and is making 100 of them for trial. These mines fulfil the conditions laid down by the Hague conference in that they do not operate after they have been laid one hour. Floating mines of this type can be manufactured so quickly when desired that the bureau of ordnance does not propose to accumulate them in large quantities. Plans have been prepared, however, for securing them in quantity and on short notice when necessary.—*Shipping*, Illustrated.

THE U. S. FLEET COLLIER "JUPITER."—The fleet collier *Jupiter* was authorized by Congress, May 13, 1908; the keel was laid October 18, 1911, and the ship went into commission April 7, 1913. She was built in conformity with the rules of the American Bureau of Shipping. She is of twin-screw, single-deck type, and was designed for a speed of 14 knots with 5500 shaft horse-power, on a draft of 27 feet 6 inches and a load displacement of 19,240 tons. She carries 11 officers and 148 men. The general dimensions of this large collier are: Length over all, 542 feet; beam, 65 feet; mean draft, 27 feet 6 inches.

She has four decks forward and five aft, the forecastle and poop each being one deck higher than the upper deck. Amidship in the cargo space there is but one deck. There are nine water-tight, five oil-tight and two non-water-tight athwartship bulkheads. There are thirteen cargo holds. Those that may be used for oil are in pairs, one on each side of the ship, and they are divided by a fore-and-aft bulkhead. The holes that are used for coal extend only the width of the ship and are of the self-trimming type. The coal-handling gear calls for a delivery of 100 tons per bucket, per hour, when the gear is operated by a winchman with one week's experience. The booms and the rigging are supported from towers, each consisting of two A-frames tied together with X-braces. There are seven of these towers in the waist of the ship and one on the superstructure. There is a single A-crane between the two after towers, which serves as an additional support for the fore-and-aft trolley ways which run between towers 6 and 8. At each tower except towers 1 and 8 there are four booms, two on each side of the tower. The thwartship cable span, which acts as a track for the trolley, runs from a boom head on one side of the ship to a boom head on the other side, and the cable span gives a travel of twenty feet beyond each side of the ship, and has sufficient height to clear the deck of a battleship twenty feet above the collier's deck. There are two winches, one clam-shell bucket of one ton capacity, and a trolley for each pair of booms. The hoisting engine is twin-cylinder, with a 10-inch diameter and 12-inch stroke; it runs in one direction only, and has a throttle operated by a foot lever. The trolley engine is twin-cylinder with 8½-inch diameter and 10-inch stroke; it has reversing links for changing the direction of rotation, and this is operated by a hand lever; the throttle being operated by a foot lever. Each bucket requires two men to operate it, one man to open and close and hoist and lower and another to traverse.

For filling and emptying the cargo holds with oil there are four 6-inch gate valves on the forecastle and 6-inch wrought iron pipes which lead from these valves down through the forecastle, where two on each side join into an 8-inch pipe, and these two 8-inch pipes in turn connect to a 10-inch riser which leads down into the pump room. In the pump room are two 14-inch by 12-inch by 12-inch horizontal duplex pumps, rated at 1000 gallons per minute each.

The main engines are of a new type, consisting of one Curtis turbo-generator, two induction motors, two water-cooled rheostats, and one main switchboard. The turbo-generator furnishes power for the motors, the function of the generators and motors being solely that of a reduction gear. All changes of speed are made by changing the speed of the turbine, thus varying the frequency of the generator, and consequently the speed of the motors. The speed reduction ratio is therefore 1 to 18. The object of this installation is to obtain the high efficiency of high-speed turbines and the high efficiency of low-speed propellers. The weight of the installation is less than that of the standard type of ship drive, and the space also is less than in any of the present installations of marine turbines or reciprocating engines.—*Scientific American.*

A SIGNIFICANT TABLE.—Aggregate displacement of United States fleet in relation to foreign fleets expressed in percentages for successive years 1909 to 1914, showing the decline of the United States percentage since 1910:

	1909	1910	1911	1912	1914
Britain	41.9	41.5	40.0	38.3	37.7
Germany	12.1	13.1	13.6	14.6	16.8
United States	14.9	16.0	15.1	14.1	13.0
France	12.6	11.1	10.1	11.7	10.4
Japan	8.0	8.6	9.0	8.7	8.8
Russia	5.1	5.0	4.9	5.4	6.1
Italy	5.4	4.7	4.5	4.0	4.1
Austria	—	—	2.8	3.2	3.1

THE UNITED STATES AND JAPANESE FLEETS.—Comment which is not without its humorous side has been made by the *Reductionist Press* on the recent discussion in America on the number of battleships to be provided for in the next program. Rear Admiral Vreeland advocated a program of four ships a year, and this was described by one of the most prominent of the reductionist journals in England as "rushing the country (America) into endless expense with the idea of keeping up a navy which should exceed that of Japan." Presumably, therefore, the Washington correspondent of the journal in question, whose statement we have quoted, is of the opinion that the United States has no business to desire a navy stronger than the Japanese. The fact remains, however, that if the United States do not enter upon an armament race with Japan they will suffer severely for it in the future. In the pre-dreadnought era America had an enormous lead over the eastern power, but in later years this superiority has been allowed to dwindle very rapidly. Including the single battleship authorized last year, America has fourteen dreadnoughts built and in hand, while the Japanese total is twelve, including the *Satsuma* and *Aki*, which are considerably superior to the *Michigan* and *South Carolina*. The number of battle guns mounted in the American ships is 144, as against 136 in the Japanese, the comparison by calibers being as follows:

	United States	Japan
14-inch	64	80
12-inch	80	32
10-inch	—	24

These facts do not seem to suggest that the United States are bent on keeping up a navy to exceed that of Japan. What they certainly do suggest in no uncertain manner is the necessity for the American people to take full stock of the situation and to act accordingly. The Panama Canal, in spite of its strategical advantages, is not going to diminish, but will considerably increase, the responsibilities of the American fleet.—*Naval and Military Record.*

NEED LARGER NAVY BECAUSE OF JAPAN.—The House Naval Committee has made public testimony of Rear Admiral Charles E. Vreeland, a member of the general board of the navy, ranking next to Admiral Dewey, before that committee which contains significant references to Japan and American naval strategy in the Pacific. Some of Admiral Vreeland's remarks about Japan, Germany, and the international contest for sea power have been retained in the printed text of his testimony, but all those statements which he thought necessary to be kept confidential have been blue-penciled in his revision of the stenographers' record of what he said.

Admiral Vreeland recommended the construction of four dreadnoughts as part of this year's naval increase program, and said the general board urged the creation of a fleet of forty-eight battleships by 1920.

The report of the general board to Secretary Daniels on naval increase this year stated the board's position in these words:

"The general board does not believe the nation stands ready to abandon or modify any of its well-established national policies, and repeats its position that the naval policy of the country should be to possess a fleet powerful enough to prevent or answer any challenge to these policies. The absolute strength necessary to accomplish this is a question that depends upon the national policies of prospective challengers and the force they can bring against us, and hence is relative and varies with their naval policies and building programs."

Policies We Must Protect.—This statement was utilized by the "little navy" members of the Naval Committee for a grilling interrogation of Admiral Vreeland.

"Does that state your views?" inquired Representative Witherspoon, of Mississippi.

"Yes, sir," replied Admiral Vreeland. "That is straight."

"What are the national policies we should be able to resist or prevent any challenge of?"

"There is one for which we need a very large navy—the Monroe Doctrine," answered Admiral Vreeland.

"What are the others?" inquired Representative Witherspoon.

"Have we abandoned the open door in China?" flashed back Admiral Vreeland.

"No," said Mr. Witherspoon. "I am trying to get at the policies. You say we should have a fleet powerful enough to prevent or answer any challenge."

"Excluding the Asiatics," replied Admiral Vreeland, naming another policy.

"From California?" inquired Mr. Witherspoon.

"From our country," said the admiral. "They are three big propositions that require force to maintain."

"Is that all?" asked Mr. Witherspoon.

"They occur to me as the most important," said the admiral.

"Do you know of any reasonable apprehension that anybody is about to challenge the Monroe Doctrine, or the open-door policy, or the exclusion of the Asiatics?"

"The exclusion of the Asiatics has been challenged," responded Admiral Vreeland.

"That is one reason why your belief is that we should increase the navy in order to prevent or answer any challenge to our policies?"

"Yes, sir," said the admiral.

"Have you any reasonable apprehension that the other policies will be challenged by any nation and that we should increase our navy for the purpose of preventing or answering that challenge—any one except the one?" insisted Mr. Witherspoon.

"The Monroe Doctrine," was Admiral Vreeland's answer.

Vreeland Differentiates Japan.—"What percentage of the navy of England could be spared," asked Mr. Williams, of Illinois, "under ordinary conditions and complication in Europe, to be sent to America to attack us?"

"I do not think she could spare any—not without an understanding with the other powers," replied Admiral Vreeland. "I should say that is also true of Germany at the present time. I should say it is true of France, also."

"Is it true of Japan?" asked Mr. Williams.

"No, sir," was Admiral Vreeland's reply.

"Would Japan be free under present conditions to send practically her whole navy across the Pacific to our west coast?"

"I don't think," said the admiral, "she would have occasion to do that. She could inflict damage nearer home."

"I infer," said Mr. Williams, "from your answers that our need for a larger navy and extensive naval construction is in the Pacific rather than the Atlantic."

"At present," replied Admiral Vreeland. "You cannot tell what the case will be a year hence; no one can tell."

"I understood you to say the European powers could hardly spare a sufficient number of their navy to come this far from their base to attack us."

"At the present time," answered the admiral. "No one can predict what alliances and ententes may exist a year hence. So long as our navy is comparatively weak, we should go ahead."—*New York Times.*

MANAGEMENT OF NAVY YARDS.—The Secretary of the Navy is giving consideration to what must sooner or later be done in the matter of defining the management and control of navy yards. He has held a number of conferences with experts on the subject, and it is now made known that his inclination is to provide for civilian management, in which particular he is supported by some of the influential members of the House Naval Committee. There are, however, difficulties of a formidable character in the way of legislation, and the ultimate execution of legislation, which will provide for civilian management. Mr. Daniels believes that the problem may safely be laid over until next December at the beginning of the short session, by which time he will be prepared to make definite recommendations. In the meantime, however, some of the committee members, notably Mr. Buchanan, believe that something should be done, if not by legislation, at least by departmental order. It has been suggested to Mr. Daniels that he place the navy yards, primarily, on the basis of industrial plants of which the superintendents or managers shall be naval officers of proven ability and experience, either naval constructors or line officers, from whichever class the competent officers may be available. In that case the commandant of the yard will be its military head, and his function will be the designation of the work which must be done in order to meet the needs of the service. Beyond that, it is proposed that the commandant's duties and authority shall not proceed. The means of accomplishing what is ordered by the military head will rest entirely with the manager free of any interference from the commandant. This is the system which meets with the most favor among those members of the naval committee who have given this subject careful attention and who assert that they were impressed with the necessity of some well-defined and permanent policy as a result of their observations made at navy yards last summer, when the committee made a trip of inspection which included the stations on the Atlantic coast.—*Army and Navy Register.*

THOUSAND-FOOT DRYDOCK FOR NAVY.—In his testimony before the House Naval Affairs Committee, Secretary Daniels advocated the construction at the navy yard, Norfolk, of a drydock of the internal dimensions of the Panama Canal, namely, 1000 feet long, 110 feet wide, with a depth of 40 feet over the sill. Such a dock would accommodate the largest dreadnought that will ever be built for the United States Navy. That the dimensions are not too great is shown by the fact that some nations, at the present time, are building warships which are considerably over 700 feet in length.—*Scientific American.*

A BRITISH COMMENT.—Mr. Churchill's naval holiday project, which none of the Continental powers have taken seriously, has quite caught on in America, and it is now considered that unless some crisis in Mexico inflames public opinion in the states the Navy Department will fail to obtain a vote for two battleships to be laid down next year. The Democrats seem persuaded that the United States can set a good example to the powers by reducing battleship construction, and Mr. Hensley's naval holiday resolution has been carried by 317 to 11 votes. By the terms of this resolution the President is required to use his influence with the powers to win their assent to suspend naval construction for one year. The geographical position of the United States, combined with the cutting of the Panama

Canal, renders it less unsafe for that nation to reduce naval armaments than for Britain or even the Continental powers to do so. We do not question the sincerity of the Democratic vote at Washington, but it is comparatively easy for a people naturally protected by four thousand miles of ocean to feel impatient of the costly competition in armaments, which menaces the economic stability of Europe.—*The Naval and Military Record.*

MILITIA PAY BILL.—The measure accomplishes what is most to be desired and which assuredly is a legitimate exaction of the organized militia, that of creating a federal military status. By means of the adopted measure, it will be possible for the general government to exercise the necessary control over the militia with the obligation on the part of the members of the militia to render active military service to the United States.—*Army and Navy Register.*

ORDNANCE AND GUNNERY

ARMY METHOD FOR DETAILING TO ORDNANCE DEPARTMENT.—Examinations were held at various places on January 26 of officers desiring to be detailed to fill vacancies existing in the ordnance department on June 20 next. The details will be made upon the recommendation of a board of ordnance officers convened as soon as practicable after receipt of the examination papers. Officers that already have served in the ordnance department and will have had at least a year's service with their commands by June 20 also will be eligible to detail, but they will not be required to take the examination. They are authorized to apply to the adjutant general of the army for detail, calling attention to any matters of record that they desire to have considered by the board convened for the purpose of making recommendations for selection.

FIRE ARROWS.—*New Weapon Against Airships.*—Successful experiments were carried out to-day with fire arrows, which are intended for use by aeroplanes against dirigibles. The arrows, which have been invented by M. Guerre, of Lyons, are about 15 inches long, and are furnished with small cylinders containing petrol and gunpowder. Two of these were thrown from the Eiffel Tower on to some straw, which was ignited. Further experiments are to be made from on board an aeroplane. If they are equally successful the new invention is expected to prove a highly-dangerous weapon.—*Naval and Military Record.*

AERO-DEFENCE GUNS.—The new 4-inch high angle fire gun mounted at the Needles battery is either the first of the type, or at any rate one of a very small number as yet in use by the army against aeroplanes. The scarcity of these guns, or rather gun mountings, reflects little credit upon the Army Council, for it has long been evident that bombs dropped from aeroplanes may cause considerable damage. The tests carried out last week at the Needles in the presence of the Secretary of War, Sir John French, and several other distinguished officers (not to mention a crowd of civilians, which may have included a few foreign spies), were considered satisfactory, but there is obviously some difference between shooting at kites towed by destroyers and "the real thing." These kites rose to a height of about 3000 feet, and were then towed away from the Needles battery as fast as the destroyer *Nubian* could go without carrying away the cable. The speed did not appear to exceed 15 miles an hour, whereas an aeroplane can fly nowadays at upwards of 90 miles. The object of the gunners was to shoot between the two kites, and in this success was easily attained. Finally, the kite cable was cut by a chance shot and the target drifted away.—*Naval and Military Record.*

12-INCH EXPLOSION.—An inquiry held to determine the cause of the terrible disaster on the proving ground at Pola recently, when a 12-inch gun blew out its breech-block and killed and wounded several persons, including among the former Vice Admiral Lanjus, has found that the explosion was due to the powder, and not to any defect in the gun. A gunnery officer, who was responsible for the preparation of the powder used, has been tried by court-martial and sentenced to six months' strict arrest.—*Naval and Military Record.*

EXPLODED BY WIRELESS.—*Italian's Mysterious Invention.*—A secret official trial of the invention of Signor Olivi, discoverer of the rays which explode gunpowder at a distance, has been made here.

Admiral Fornari submerged in the Arno two torpedoes containing white and two containing black gunpowder. On receiving a signal, Signor Olivi, who was stationed on the tower of the Palazzo Capponi, started the apparatus. Within a minute all the torpedoes exploded.

The Italian Government has secured the invention.—*Naval and Military Record.*

MILITARY MINES.—Considered as a man-killing arrangement the ordinary military mine is not particularly efficient, as it forms a funnel-shaped crater such that any hostile troops not standing within the radius of effect, which rarely exceeds a couple of yards, will escape injury. Mr. Aasen, the inventor of the hand grenade which bears his name, has devised a greatly improved form of military mine. This consists of a shell containing 400 segments with central high explosive charge, inserted into an iron cylinder containing a small charge of black powder, the whole weighing 9½ pounds. The cylinder is buried at a depth of one meter, and the black powder is arranged so as to be fired either by electricity from a distance or by contact buttons on the ground surface. When the mine is fired the shell is blown upwards through the ground till it reaches the surface, and is there detonated by a chain connected at one end to the fuse of the shell and at the other end to the cylinder, which remains in the ground. The length of the chain is so adjusted that the detonation of the shell takes place about 2 feet clear of the ground. The effect is that the 400 segments fly out nearly horizontally, with sufficient force to pierce a wall one brick thick at a distance of 10 meters, and with an effective radius of about 100 meters. It is considered that in siege and position warfare the Aasen mine will be of great value.—*United Service Gazette.*

EXCERPT FROM REPORT OF BOARD OF OFFICERS DETAILED TO MAKE RECOMMENDATIONS FOR DEVELOPMENT OF WASHINGTON NAVY YARD.—While the product of the gun factory during every stage of its development has been of the highest quality, the plant is too small to adequately meet the progressive needs of the navy, particularly as the demand for heavy and more powerful ordnance has, during the past 10 years, been greater than the plant could expeditiously supply. It is important to note that the reserve of heavy ordnance possessed by the navy is so small that it constitutes a distinct limitation to the operations of the fleet. This is a serious situation and one that should be promptly met.

It is, therefore, urgent that the industrial facilities for the manufacture of heavy naval ordnance should be increased in either national or commercial plants. Unless the commercial plants can either be assured of continuous work, or at least of a reasonable profit on the capital invested in their armament factories, it cannot be expected that they will make extensive additions to their plants for ordnance manufacture. Such improvements involve large expenditure; for example, the manufacture and installation of even one lathe adapted for heavy ordnance work would require at least a year and would cost about $75,000. No private firm could afford to provide an adequate installation of such machine tools unless assured of sufficient work and profit to warrant the great expenditure in-

volved. If, however, the department decides to manufacture all naval ordnance in government plants, the early increase of industrial facilities at the gun factory is a matter of urgent importance.—*Army and Navy Register.*

PROGRESS IN GUN DESIGN.—Mr. Albert Vickers, the chairman of the Vickers Company, at the luncheon which followed the launch of the *Emperor of India,* gave some insight into the immense progress in design that has been made. He said that in respect of gunnery the advance in the past seven years had been unequalled in any corresponding period in the history of naval construction. This he forcibly illuminated by stating that the muzzle-energy developed by one round from all the guns in the latest battleship was equal to lifting the battleship through a height of 27 feet, or completely out of the water, whereas the corresponding energy developed by one round of the guns in the *Dreadnought* of 1906 would only raise the same load through 17 feet. He referred also to the fact that the ballistics had been arranged to ensure greater accuracy and less wear. At the same time the power of the big gun in battleships was between 50 and 60 per cent greater, and by reason of the improvements in the gun mountings, the effectiveness of the complete battery was probably doubled. This was more remarkable as the length of the ship had only increased by about 20 per cent, and the displacement by about 50 per cent, while the speed and armor protection had also been greatly improved.—*Engineering.*

GUN TRIALS OF A TRIPLE-TURRET BATTLESHIP.—It has been decided to equip the battleships *Duilio* and *Andrea Doria* with 21-inch Whitehead torpedoes, instead of the 18-inch model, with which the *Dante Alighieri* and the three *Cavours* are fitted. The 21-inch torpedo is also to be supplied to the fifteen 1000-ton destroyers now building. The 18-inch type which has hitherto been the standard in the fleet is reported to be inferior, as regards speed and range, to contemporary foreign models. The fact is that torpedo work has been somewhat neglected in the past, and efforts are now being made to increase the efficiency of this arm.

A trustworthy Italian correspondent writes to us as follows:

The reports in the foreign press concerning alleged defects which were revealed during the gun trials of the *Dante Alighieri* are wholly untrue. During both the first and subsequent trials an entire broadside was fired from the heavy guns without causing the least damage to the ship. Guns and mountings worked without a hitch, and after the trials were found to be in perfect condition, notwithstanding the abnormally heavy strain to which they were subjected. The training gear of the triple turrets also worked most satisfactorily. The artillery commission on board professed themselves thoroughly content with the result of the trials, and a message to this effect was conveyed by the Royal Italian Admiralty to the makers.

This authoritative communication is interesting in view of the adverse criticisms passed upon the *Dante's* armament by German publications, including the official "Nauticus."—*Naval and Military Record.*

THE FOUR-GUN TURRET.—The French naval authorities are evidently possessed by no fears as to the success of the quadruple turret, for while the ships of the *Normandie* class, none of which are yet launched, are to have twelve 13.4-inch guns mounted in this fashion, the *Tourville* class are to have an additional turret—that is to say, a total of sixteen heavy weapons in four gun positions. Thus, for the first time, we shall see ships bearing twice as many guns on the broadside as the original dreadnought. It is curious that Great Britain alone among the principal naval powers has never put more than ten heavy guns into a dreadnought; and it is to be assumed that the same reasoning which has brought about this result has also led to the multiple-gun turret being left alone. These new French ships will have a broadside of 19,040 pounds; and although our Paris Correspondent suggested last week that this would make them superior

to our *Royal Sovereigns*, we may point out that if, as was then and is generally assumed, the latter are to mount ten 15-inch guns, their broadside will amount to 19,500 pounds, which is slightly heavier than that of the new French ships. Provided that the four-gun turret is a complete success, the technical section of the French Ministry of Marine will merit unstinted congratulations on the manner in which they have developed their designs in a comparatively short period. So far four designs have been produced, and their principal characteristics are given in the following table:

	Broadside		
Type	Guns	Pounds	Displacement
J. Bart	10	12-inch = 9,700	23,095
Bretagne	10	13.4-inch = 11,900	23,117
Normandie	12	13.4-inch = 14,280	24,830
Tourville	16	13.4-inch = 19,040	29,500

The number of 5.5-inch guns has increased from 22 in the first two classes to 24 in the *Normandies* and 28 in the *Tourvilles.—Naval and Military Record.*

OPERATION OF TURRET GUNS.—The recent announcement that the British dreadnought *Invincible* is to have its gun-controlling mechanism changed from electric to hydraulic gear has met with much criticsm among electrical engineers in Great Britain. It is claimed that the change signifies no superiority of the hydraulic system, but is due chiefly to friction between two departments, one of which controls the guns and the other the electrical equipment. In our own navy, the guns are operated by electric motors under control of hydraulic variable speed gears.

GUNS AND ARMOR.—In the opinion of Admiral Sir Michael Culme Seymour, it would be a "disastrous" step to abolish thick armor in battleships, as advocated by Admiral Sir Reginald Custance, even though we retained moderate protection against secondary batteries. In his brief letter to *The Times* Admiral Culme Seymour is content to record that view dogmatically, but we hope that he and other officers of experience and knowledge will go more deply into the merits and demerits of the Custance theory. There is, beyond dispute, a close relation between long-range fighting and the retention of thick armor, and this fact has been convincingly established by Sir Reginald Custance in his "Ship of the Line in Battle." The weight of naval opinion is at present against Admiral Custance, but he has a following, and it is not improbable that heavy armor may ultimately be abolished. The Admiralty displayed tolerance in encouraging Admiral Custance to express his theory in a series of War College lectures, for his remarkable book is mainly a reproduction of those lectures.—*Naval and Military Record.*

METAL-STOCKED RIFLES.—Metal is replacing wood in most departments of modern engineering, and it is not a matter for surprise that a rifle with the stock at least partly composed of metal should have made its appearance. The disadvantages of the long fore-end of the present wooden stock are well known to ballistic experts; it warps and bends the barrel, and the bands cause nodes of vibration which irregularly affect the flip of the muzzle. In the new Mauser rifle the wooden fore-end is replaced by a corrugated metal tube, with a clear space between it and the barrel; the tube is firmly attached to the butt, and has a collar surounding the muzzle, which slides to allow of expansion. The sights and bayonet are attached to the metal tube. It is stated that the shooting of the rifle is much improved by the metal stock, especially at and after rapid fire, and that the whole weapon is stronger, lighter, and more comfortable to handle and to carry. Aiming is also rendered easier, since the metal tube keeps comparatively cool, and there is no mirage from the hot barrel.—*United Service Gazette.*

RUSSIAN GUNNERY PRACTICE.—Experiments have recently been carried out by vessels of the Black Sea fleet with the obsolete battleship *Tchesmé* as a target. The damage caused by the firing caused the ship to founder. A 12-inch shell which entered slightly below the waterline amidships cut a clean hole through the 16 inches of compound armor which the *Tchesmé* carried, and sent her to the bottom. The *Tchesmé* was launched at Sebastopol in 1886. The armored cruiser *Bayan* has received the prize offered by the Tsar for the ship holding the gunnery record in the Baltic fleet.—*Journal Naval Engineers.*

WHY COSTLY EXPERIMENTS ARE MADE.—Lord Charles Beresford asked the First Lord of the Admiralty why the firing practices carried out when H. M. S. *Empress of India* was used as a target were conducted in deep water, and the number and class of guns that were on board the ship at the time she was sunk in the channel.

Mr. Churchill: The place and conditions of the *Empress of India* firing were selected by the commander-in-chief of the home fleet in consultation with the naval members of the Board of Admiralty. I accept full Parliamentary responsibility for approving the course proposed. The object of the firing was not, as the noble lord appears to suppose, to ascertain the effect of shell fire on the structure of the target vessel, the soft armor and antiquated construction of which would have afforded no useful information. The object was primarily to give the officers and men of the fleet experience in firing at a ship under conditions approximating as nearly as possible to those of war, and in these circumstances to test and correct the methods of controlling fire and fire tactics. Every effort was made to render the target unsinkable; but I was informed that it was advisable to anchor her in deep water, so that in the event of her sinking she would not become a danger to navigation. All fittings and movables of value were stripped from the ship. The guns on board, four 13.5-inch and ten 6-inch of very early patterns, would not have repaid for the expense of removal. I shall be very ready, if desired, to discuss fully the general policy of so costly an experiment when the estimates are being debated. For the present it is sufficient to observe that other leading maritime countries, especially France, Germany, and the United States, have found it necessary in late years to employ old war vessels as targets under conditions which have in many cases led to their total loss, and considerable sums of money have in addition been provided for the experiments. We ourselves have periodically adopted a long succession of similar measures entailing in the present century the destruction, among others, of the following vessels: *Belleisle, Scorpion, Landrail, Hero, Edinburgh,* and *Empress of India.* In October last the Russian battleship *Chesma,* a vessel of somewhat larger displacement and of approximate value to that of the *Empress of India,* was fired at and sunk by a division of the Black Sea fleet under similar conditions, and presumably for similar purposes as those of the *Empress of India* firings. The information derived by such experiments is considered by the responsible naval authorities of this country fully to justify the expense involved, and is indispensable to the progress of British naval science and the efficiency of the fleet. In these circumstances it would have been a very serious step for a minister to over-rule his professional advisers and on purely financial grounds to deprive the navy of experience and information for which other countries, to whom sea power is of less consequence, have shown themselves ready to pay.—*Naval and Military Record.*

MEANS OF REPRESENTING MOVING AIR TARGETS.—Translated from *Russian Artillery Journal,* April, 1913, by Lieutenant R. C. Rome, R. F. A.—At the present a demand has arisen in military circles for targets, representing moving aeroplanes or dirigibles. Only by the existence of such targets are the verification and perfection of the new regulations for firing at such targets possible. Of course, it is difficult to have targets giving a full

representation of moving aeroplanes or dirigibles. It will be sufficient if we will satisfy ourselves with more modest demands, viz.: that the target should move at a sufficient height above the ground (approximately 3500 feet), that the movement of the target should acquire a sufficient velocity, and that the acquiring of such targets should be accessible for the artillery arm.

In the experiments carried out in the Petersburg military district, for the representation of moving air targets, captive elongated balloons, captive kites and pear-shaped balloons were used.

But all these methods showed essential disadvantages. Thus, the captive balloons, towed by means of tugs, gave an insufficient elevation and too low a velocity. Besides these disadvantages this method is costly, and for this reason not applicable for the majority of our batteries.

Captive kites also gave too low a velocity, and for elevation demanded a strong wind.

The best method was the use of pear-shaped balloons, supplied by the apparatus of M. Kooznetzov, which does not allow the balloon to rise higher than a predetermined height. When the balloon reaches this height, the gas-tube automatically opens and the apparatus begins to descend, describing a sloping trajectory. But this method has the following disadvantages, disclosed by experiment:

(1) It is recommended to send up the balloons attached in pairs, in order to increase the value of the experiment.

(2) The hydrogen, acquired by special means, eats through the elastic envelope which sometimes bursts during flight.

(3) Rain wets the balloons, and they will not rise.

(4) Maximum elevation acquired not more than 3500 feet.

In view of the above-mentioned disadvantages of these pear-shaped balloons Colonel Goorshin produced a rocket with parachute. The rocket flies from a special frame and after the explosion of the rocket-head out of the latter shoots the parachute which, opening in falling, flies on the wind and serves as a moving target. The cost of the rocket is about 6½ roubles (13/-). The preliminary experiments with this rocket at Otchakov in the autumn of 1912 gave satisfactory results, and the Artillery Committee determined to try it in the Officers' Artillery School.

Although the velocity of the parachute will depend on the wind-velocity, having in view the results of the preliminary trials (small percentage of failures, height of flight about 3500 feet), and also the low cost of the proposed rocket, we expect that it will deserve the attention of our gunners.—*Journal of the Royal Artillery.*

NAVIGATION

SAFETY OF LIFE AT SEA.—The International Conference on Safety of Life at Sea, which was convened by the government last autumn, concluded its labors in London on January 20, the first meeting having been held on November 12 last. The convention was signed by the plenipotentiaries of twelves states and three British Dominions, all of which were separately represented, viz.:

British Empire (including Canada, Australia, and New Zealand).	Italy.
Germany.	Spain.
France.	Sweden.
United States.	Norway.
Austria-Hungary.	Holland.
	Belgium.
	Denmark.

It is not too much to say that the success of the conference marks an epoch in the world's mercantile marine and is a triumph for international action. The convention, it is understood, contains no fewer than 74 articles

and extends to about 60 printed pages, the recommendations being of a far-reaching character. As, however, the actual text of the convention is not to be published until February 15, detailed reference to its provisions, and particularly to the new constructional requirements and life-saving appliances, will have to be made in a subsequent issue of *The Shipbuilder*.

AUTOMATIC STEERING COMPASSES.—The advance in technical arts in general and especially the tremendous improvements that the gyro-compass has undergone in the last few years indicate that the time is now not far distant when on large ships helmsmen will be replaced by automatic steering compasses. . . . Long before the gyro-compass was a reality the possibility of the production of a magnetic steering-compass was thought of but the project lapsed because of the insuperable difficulties. The proposed arrangement for automatic steering is as follows: A small mirror is secured perpendicular to the face of the compass-card and is movable in an annular groove for adjustment to the desired course. A beam of light coming from the lubber's point strikes the mirror (set to course); if the ship is on her course, the beam is reflected back to its source; if the ship is off her course, the beam of light reflected by the mirror falls on one of two selenium screens that flank the lubber's point and so increases the conductivity of the relay circuits in which the selenium screens are placed and in which a weak current is flowing, as to cause the relays to operate, thereby closing a switch and causing an electric motor to function in such a manner as to operate the rudder and thus bring the ship back to her course. It is easy to see that the functioning of this apparatus would be such as to cause the ship to trace a sinuous course, similar to that traced by a torpedo through the operation of its Obry gear, but it is hoped that arrangements can be made to dampen the oscillations and so secure the steering of a more nearly straight course.—*Mitt. aus dem Geb. des Seew.*

ALASKAN HARBORS.—The boundless resources of Alaska are only now beginning to dawn on us after that territory has been in our possession nearly half a century. So far as shipping facilities go, Alaska is rich in numerous interior harbors, unrivaled in position, safety, and comfort, for shipping and naval use. Cordova, Valdez, Portage Bay, Seward, and many others are deep, well sheltered, and easily fortified from outer attack, even from Prince William Sound itself. These splendid harbors are each at least ten miles long, three miles wide, have unobstructed approach and deep water, and are sufficiently commodious to hold the Pacific fleet at maneuvers. They are ever flooded with the warm tides of the Japanese current and ice never forms in any of them. More ice forms in Boston, New York, or Washington harbors than in any of the south Alaskan bays. The triangular Gulf of Alaska, too, thrusts its northern apex far into the southern coast of Alaska. Prince William Sound, Alaska's greatest harbor, is as large as Chesapeake Bay, and as easily protected from assault by an enemy as San Francisco Bay. Its front is protected by Montague and other large islands, while wide entrances between the islands and the mainland afford easy access from the ocean without rock or sand bar to threaten wreck.—*Marine Journal.*

STEAM ENGINEERING

"THE BLADELESS TURBINE."—The present-day tendency in warship-engine design is towards simplification of the units comprising the propelling mechanism, and upon their economical combination, the value of the whole from a military point of view depends. Until within a few years the stage expansion reciprocating engine was regarded by engineer experts as the final word in naval engineering, but with the advent of the marine turbine, the whole question of marine propulsion was revolutionized. Although the present marine turbines give good results as regards economy and all-round efficiency at the higher speeds, the question of space is still a

very acute one; also the unavoidable steam losses which must of necessity obtain with all the present marine turbine types, points to the fact that the ideal engine has yet to be evolved. With the introduction of the marine Diesel, great hopes were entertained that this type of engine would prove almost ideal as the main motive power for our warships. Unfortunately, the experiments which have been and are still being carried out disprove these hopes. The necessarily limited size of cylinders, and the question of discovering a metal capable of withstanding the temperatures the cylinders are subjected to, place the marine Diesel, at least for the present, out of practical consideration as the main propelling power. Another big factor against the adoption of this prime mover is the complication of parts, with consequent added risk of failure.

An invention which, if the realization of the experts is justified, will revolutionize naval and marine engineering has been evolved by a Swiss engineer. This invention, known as "the bladeless turbine," combines all the principles of the present-day steam turbine, without the consequent disadvantages. The disadvantages of the present-day turbine may be summarized as follows:

(a) Danger of stripping, which necessitates long and costly repairs.

(b) Priming of water in the boilers, a grave source of danger.

(c) Owing to the fine blade-tip clearances, warming up of the turbines must be carefully carried out, and ample time allowed for thorough expansion of the component parts.

(d) There is a great loss of efficiency due to the action of the steam on the rotor and casing blades.

(e) A separate turbine is required for reversal.

In the bladeless turbine the inventor claims to have practically eliminated all these disadvantages. In this invention the casing and rotor blades are dispensed with altogether, the turbine rotor being revolved by the "lick" of the steam on suitable discs arranged on the rotor's circumference. Nozzles are arranged for in the rotor casing, through which nozzles the high pressure steam emerges, and the full benefit of the expansive energy of the steam is fully utilized. In this engine no reverse turbine is required, and in this respect the engine is unique. For the reversal a suitable set of nozzles are arranged for in the casing, these nozzles pointing in the reverse direction to the ahead ones, the simple reversal of the steam flow causing the rotor to revolve in the opposite direction. The advantages of this new invention are as follows:

(a) Initial cost greatly reduced.

(b) No long and costly repairs.

(c) The space occupied by this turbine is very much less than that required by the ordinary impulse or reaction turbine, and this, from a naval point of view, is all-important.

(d) The number of attendants is greatly reduced, thus allowing a much bigger actual fighting staff to be carried.

(e) Priming of the boilers will not materially affect this turbine.

(f) Maneuvering of the engines is greatly simplified, a great asset to a huge fighting machine like the modern warship.

Should this turbine fulfil, even in part, its inventor's claims, it will go far to revolutionize the design of our warships, where space is such an essential factor; and the further trials of this engine, especially as regards steam consumption, ease of reversal, and simple manipulation, will be watched with keen interest by those responsible for the design of the engines of our warships.—*Naval and Military Record.*

EXPLOSIONS IN DIESEL ENGINES.—Since the autumn of 1909 there have been no fewer than eighteen reported cases of breakdowns with Diesel engines, nearly all of which were due to explosion. In order to draw attention to the risk involved from explosion in this type of engine, an abstract is given of the report issued by Mr. G. S. Taylor, His Majesty's inspector of factories, on the explosion of a Diesel engine at the Bray

Electricity Station in Ireland. The nature of the explosion is described and also its principal causes and the means for avoiding such a breakdown. Another instance is cited in the case of an explosion of a blast vessel, which occurred on the *Vulcanus*. It is suggested that the observance of the following recommendations would tend to reduce the risk of explosions and accidents in connection with the running of Diesel oil engines: Compressed oxygen, on account of its intense chemical affinity for combustible gases, like hydrogen, should not be used for the purpose of recharging air vessels and a warning to this effect should be issued by the makers of Diesel engines. Definite instructions should be issued by the makers with regard to the adoption of safe methods for recharging air vessels. Only competent enginers or experienced men under the direct supervision of a qualified engineer should be employed as engine attendants on Diesel plants. Traces of oil or oil vapors should be removed as far as practicable from the compressed air before it passes into the blast vessel. Air vessels, especially blast vessels, should be cleaned and examined internally as far as practicable once every twelve months. They should also be tested hydraulically once in every four years, and the amount of expansion of the vessel under the test pressure should be carefully gaged. Some device should be fitted for preventing the transmission of flame explosions along the compressed air pipes.—*The Marine Engineer and Naval Architect.*

MARINE BOILER EXPLOSIONS.—Among the reports issued by the Board of Trade recently occur a few which are of interest to the marine engineer, and are well worthy of reference. The main boiler of a small coasting steamer exploded, fortunately without injuring anyone. The boiler was of steel, with iron tubes, and of the ordinary single-ended marine type. There were two plain furnaces each having a separate firebox. The principal dimensions of this boiler were—Shell diameter 12 feet 6 inches, length 10 feet 3 inches, shell plates $1\frac{1}{16}$ inches thick, in two pieces with treble riveted, double butt straps, furnaces 3 feet 7 inches external diameter, 6 feet 7 inches long, wrapper plates $\frac{5}{8}$ inch thick, the crown plates being stayed by six girders with stays screwed into the plate and nutted. Two spring safety valves were fitted for a working pressure of 160 pounds per square inch. On leaving port the water in the boiler was stated by the attendant to have been $1\frac{1}{2}$ inches from the top of the glass, and during his watch the water appeared to be rising; this he thought might be due to the condenser leaking. As the water still seemed to be gaining he opened the blow down for a few minutes without any apparent effect. About midnight he heard a report while in the engine-room and at once stopped the engine; a second report followed and the stokehold and engine-room were filled with steam. The attendant and fireman escaped on deck and the vessel was subsequently towed into port. On examination it was found that ten stay nuts had been forced off the girder stays of the port combustion chamber, and the crown plate had collapsed about 5 inches. There were no signs of wastage and the plates were practically free from scale. The water gages and mountings were found to be clear and in good working order. When the water was just showing in the glass there were about $3\frac{1}{2}$ inches over the combustion chamber crown. The inference drawn from the investigation was that the attendant had mistaken the quantity of water in the boiler and the glass had shown false water, due to a valve being shut or a pipe being choked; had he known, as he should have done, how to apply the test he would have saved the boiler from disaster. Another explosion occurred in the boiler of a steam trawler, fortunately without causing injury to life or limb. The material of the boiler was steel; it was 12 feet diameter by 9 feet 9 inches long, with two corrugated furnaces, $42\frac{1}{2}$ inches diameter at the plain parts and $46\frac{1}{2}$ inches diameter over the corrugations. The front end was made up of two plates, the top being $1\frac{1}{16}$ inches thick, and the lower $\frac{15}{16}$ inch thick, flanged inward for the furnaces, to which it was double riveted. The spring safety valves were loaded to 200 pounds. It was fourteen years old, and a new starboard furnace and port fire-

box had been fitted in 1905. As the original furnace had been welded to the back tube plate, a new saddle plate had to be fitted. When the repairs were completed the boiler was tested to 300 pounds hydraulic pressure. The vessel proceeded on a run towards Iceland, and, having arrived at the fishing area, the engines were stopped and preparations were made to shoot the nets, and the deck machinery was got ready. The engine driver, on returning below, heard some steam blowing, and tracing it to the stokehold, found the plates covered with hot water and the passageways full of steam. As soon as the place was clear, he found the front end-plate fractured above the port furnace for about 22 inches, and he was able to insert the blade of a knife in the center of the crack. A temporary repair was effected by means of ½ inch studs at each end of the crack, and the plate caulked. This was enough to enable steam to be raised, sufficient to shift to safer anchorage. This being accomplished, the boiler was again emptied, and the length of the crack was laced with ½ inch and ⅝ inch studs. This repair admitted of bringing the vessel back to her starting port with 90 to 95 pounds pressure, but as the fires were allowed to cool down the crack opened out and leaked. The cracked part of the plate was cut away and welded up; a covering patch of $\frac{9}{16}$ inch Low Moor plate was also fitted inside the boiler. A similar covering plate was also fitted over the starboard furnace, and both corrugated furnaces were removed and replaced by plain furnaces. The giving way of the plate was attributed to panting action, caused by the expansion and working of the furnaces, gradually leading to an almost imperceptible grooving, ultimately ending in rupture.—*Marine Engineer and Naval Architect.*

VERMONT SHAFT ACCIDENT.—The accident to the shaft of the U. S. S. *Vermont* will not result in any new investigation of the causes of such accidents. A most thorough investigation of this subject was conducted by the Navy Department about two years ago without any results so far as determining to a certainty what is the cause of the breaking of shafts which are made from the very best quality of metal. It is generally believed that the chief cause of such accidents is certain vibrations of the ship and engines, not necessarily at a high rate of speed, but more often at low speed. The Navy Department, says the *Army and Navy Journal*, has been conducting experiments for two years to ascertain what are the critical speeds for engines, and an effort is being made to secure an instrument by which these vibrations can be measured. This investigation has gone far enough to determine that fifty revolutions, for example, may be a dangerous speed for an engine, while it may be perfectly safe to run at a higher rate of speed up to a hundred revolutions, when a critical speed is developed again. Injurious vibrations to shafts occur at different rates of speed for the same type of engine. There is a theory that no general rule can be laid down for any type of engine, but each must be treated as a separate case. In order to do this it will be necessary to secure a delicately constructed instrument to measure the vibrations of each engine. —*Shipping*, Illustrated.

INCREASING SIZE OF STEAM TURBINES.—There is an extraordinary development taking place in the size of the individual unit in the field of steam turbines. Recently, the fact that a unit of 20,000 kilowatts had been built, aroused comment; yet during the past year one of this size and another turbine of 25,000 kilowatts have been built, and it is stated that orders have been placed for four of 30,000 kilowatts and one for 35,000 kilowatts.—*Scientific American.*

WESTINGHOUSE REDUCTION GEARS FOR NAVAL VESSELS.—The Westinghouse Machine Company, East Pittsburg, Pa., recently received contracts for marine gears for the United States torpedo-boat destroyer tender *Melville* and for the cruising gears of the battleships *Pennsylvania* and *No. 39.*

The gear for the *Melville* will have two pinions on the horizontal center line, diametrically opposite each other, the pinion speed being 1400 revolutions per minute and the propeller revolutions 110 per minute. The total horse-power transmitted is nominally 2000 per pinion.

The *Pennsylvania* and battleship *No. 39* will each have two gears, which are connected to the main turbine shafts by disconnecting clutches, the cruising turbines being out of service at full power. Each of the *Pennsylvania's* gears will nominally transmit 1400 shaft horse-power, and each has two pinions on the horizontal center line, the reduction being from 1785 to 119 revolutions per minute.

The gears for battleship *No. 39* are also for use at cruising speed only, the speed of the cruising turbines being 2500 revolutions per minute, and that of the propellers 192 revolutions per minute at cruising speed. The horse-power of each of the cruising turbines of battleship *No. 39* will be 2000, and in this case a different arrangement of cruising turbines is used, there being only one cruising turbine on each shaft, instead of two as in the *Pennsylvania;* therefore each gear of battleship *No. 39* has only one pinion.

The advantages of the Westinghouse floating frame for automatically maintaining the alinement of the pinions and gear and equalization of the tooth pressures and the compensation of the torsional deflection is rapidly becoming known by engineers, and has resulted in many orders for gears, there now being over 50,000 horse-power under construction and over 50,000 horse-power in operation.—*International Marine Engineering.*

EMERGENCY RUDDER TO AVOID COLLISION.—We have received from Mr. George E. Bell, of Cambridge, Mass., a sketch of a design for rudders to be used in the event of a threatened collision. It consists of two rudders, attached one on each side of the ship just below the water-line, which normally lie flush with the side of the ship, and are provided with operating mechanism controlled from the bridge, whereby one or other can be thrown out to produce a powerful turning effect upon the ship. The controlling gear is such that the rudder can be moved out gradually through its maximum arc of turning, and sudden violent wrenching effects upon the rudder or its attachments to the ship prevented.—*Scientific American.*

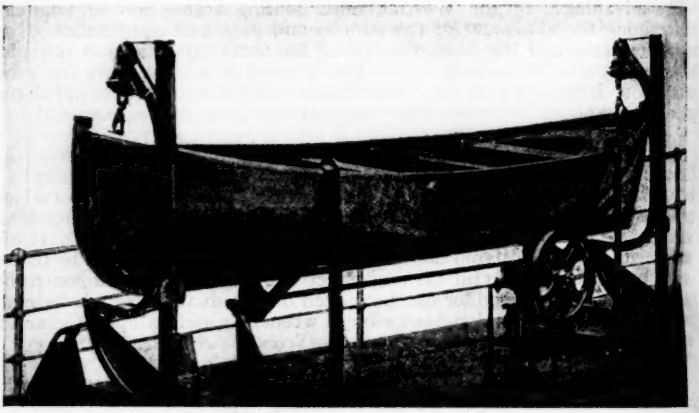
NURNBERG TYPE OF INTERNAL COMBUSTION ENGINE.—The designs of an internal combustion engine of the Nurnberg type have been acquired by the Bureau of Steam Engineering of the Navy Department for erection at the New York navy yard. The Navy Department paid $32,098 for the plans, which includes the license to manufacture. Another engine might have been purchased, but it would have necessitated spending about $100,000 more for the right to manufacture. Some of the Diesel engine people wanted almost the entire appropriation of $250,000 for their plans.

The Bureau of Steam Engineering of the navy is now reported to be in favor of turbines for battleships, as compared with reciprocating engines, notwithstanding that at ordinary cruising speed the economy is somewhat less in the case of turbines than with the reciprocating type. Naval engineers are encountering considerable trouble with some of the turbines, involving delay in repairs. There has been some difficulty with the main turbines of one type, and with the cruising turbines of another type. In several of the destroyers the blades have been stripped from these cruising turbines, but there has been little or no trouble with blading in the larger or full-power turbines of this type. For high power and for speed above 20 or 21 knots the naval view is in favor of the turbine.—*Shipping,* Illustrated.

A NEW BOAT DAVIT AND RELEASING DEVICE.—Visitors to the motor boat show last month were given an opportunity to view a model of the Schmidt patent boat davit exhibited by the Marine Efficiency Company and invented by Captain G. C. Schmidt, of Sweden. The Schmidt davit consists chiefly

of two upright steel frames bolted to the deck in which two steel quadrant arms move or roll. The base of these quadrants is sector-shaped, while from the upper end two steel prongs project from each arm in which the lifeboat hangs. The latter is swung by an individual steel cable at each end running through pulleys (not blocks) at the ends of the uprights down to the deck, where both cables are wound around a revolving steel drum. This latter fact assures the launching of the lifeboat on an absolutely even keel at all times. As soon as the boat has been hoisted it is fastened to a support on the deck composed of two clamp eccentrics, engaging the keel of the boat, raising it under two chocks or hooks which grip the boat-rail and then are securely locked by a controlling lever.

When the latter is released the eccentrics fall away and the boat hangs in the prongs at the end of the quadrant arms. Then the construction of the Schmidt davit being beyond the center of gravity the quadrants immediately begin to roll outward, swinging the boat down over the side of the ship. The cables continue running out over the pulleys until it is within a foot or so from the water. The friction brake is then applied, by which the lowering is controlled from the very start. With the single pull of the lever the boat is dropped into the water by a mechanical releasing device attached to each end of the boat, but so installed that both ends are released simultaneously. The entire operation is so simple that it takes only two minutes for a boat load of sixty people to reach the water and one man can handle the device and have full control of the descent from the boat itself from the time it is released on the deck until it rests on the water free.



THE SCHMIDT BOAT DAVIT

Boats by means of this davit it is claimed may be lowered close to the side of a ship in a heavy sea and thus enable them to be stopped at any deck to take on passengers. With this device it is also claimed that a lifeboat may be launched safely from a ship having a list of upward of thirty degrees.

TEST OF ALASKAN COAL.—The report of the comparative steaming tests of Pocahontas and Bering River coals by the U. S. S. *Maryland*, conducted under the Bureau of Steam Engineering of the Navy Department, has resulted in the following conclusions:

1. The percentage of ash and clinker in Bering River run-of-mine is excessive, thereby throwing exhausting work upon the personnel.

2. More boiler power, and to a certain extent forced draft, had to be used with Bering River coal for equal duty. Although the firing appears to have

been better in the Pocahontas test than in the Bering River the discrepancy in coal consumption is too great to allow a hope for results with Bering River coal that may in any way compare favorably with those attained with the Pocahontas.

3. Bering River coal is superior to Pocahontas in smokeless qualities.

4. The number of miles that can be steamed with Bering River on one bunkering is much smaller than can be accomplished with Pocahontas—approximately one-half. That is to say, with Pocahontas coal the *Maryland* could steam from San Francisco to Yokohama direct and arrive with approximately 300 tons in her bunkers, while with Bering River she could steam only as far as Honolulu and arrive with the same amount in her bunkers.

Conclusion.—Bering River run-of-mine coal is inferior to Pocahontas.

Forty-eight Hour 10-knot Test.—In view of the unexpectedly large coal consumptions with Bering River coal during the other tests, no coal was available for this test. The absence of these data is not felt, however, in view of the data furnished during the other trials.

Final Conclusion from the Foregoing Tests.—Bering River run-of-mine coal is unsuitable for naval use.

In order to test accurately the suitability of screened and washed Bering River coal, the coal to be tested at the engineering experiment station, United States Naval Academy, Annapolis, Md., was screened and washed to represent the best grade that can be expected from the Bering River fields.

The comparative evaporative test of the two coals conducted at Annapolis has resulted in the conclusion that the Bering River coal "is not considered suitable for use in naval vessels."—*Army and Navy Register.*

PROBLEM OF FUEL OIL FOR THE NAVY.—It has been expected that the government would be able to obtain possession of oil lands in California so as to have control of the source of supply of fuel oil and thereby regulate the price, which is increasing at a tremendous rate. It is now found that the land is in litigation, and possession cannot be obtained. Conferences have been held recently at the Navy Department between Secretary Daniels and Chairman Padgett and representatives of a large oil interest in California concerning the proposition involving an outlay by the government of about $20,000,000. Another oil man with a source of supply in Mexico has informed the department that if the government advances $2,000,000 to enable him to obtain oil vessels and construct large tanks in southern Louisiana or Mississippi, he will undertake to furnish the Navy Department 7000 barrels of oil a day at prices about 40 per cent below the market rate. A serious situation is created by the fact that the design of new battleships is with a view to burning oil exclusively and without the means of a return to coal if it were necessary. In other words, the boiler rooms are not as large as they would be for burning coal, and it has been pointed out by Rear Admiral R. S. Griffin, engineer-in-chief of the navy, that if it became necessary to stop burning oil the service would be in something more than a predicament. Recently two officers from the Bureau of Steam Engineering visited the California oil fields and went into the subject very thoroughly with the result that it will be possible by leasing the oil lands and selling the by-products to obtain fuel oil at the rate of 43 cents a barrel instead of the present rate of $1.39. Investigation has also been extended to the oil lands of Oklahoma now held by the Osage Indians, but the efforts on the part of the Navy Department to have the Interior Department reserve some of those lands for the use of the navy have failed, the Interior Department taking the position that the lands would have to be put up to the highest bidder, and under these circumstances the Navy Department is not in a position to compete. For the present it looks as if the Navy Department would be obliged to await the outcome of the present suits for recovery of oil lands and, in case of decision favorable to the government, to take over the developed lands, which may revert to the government as

additional portions of the navy petroleum reserves.—*Army and Navy Register.*

BATTLESHIP-FUEL PROBLEM.—The fact that the British Admiralty has made a return to coal-burning vessels from the type of battleship which was designed to burn oil exclusively will, of course, have no influence upon the design of the American battleship. The great problem with us is to obtain control of the sources of supply of fuel oil and to secure a regulation of price, which is most essential in consideration of the enormous increase in the cost of the fuel that is going up in amount by veritable leaps and bounds. There will probably be no more battleships designed to burn coal, on account of the very undeniable advantages which are derived from an exclusive oil-burning system. The navy has definitely abandoned the use of coal in future fighting-ship design, and all destroyers, submarines, and battleships are being designed for oil-burning. There are now built and building 4 battleships, 41 destroyers, 30 submarines, 1 monitor, 3 tank ships, 1 submarine tender, and several tugs and small vessels, all of which are to use oil fuel. Eight battleships burn both coal and oil, and one transport and a supply ship will be fitted to burn either oil or coal. So far as fuel oil has its influence upon speed, there will be no change from the standard and conservative rate of 21 knots, in all probability, in any of the battleship designs hereafter developed. Every fraction of a knot of increase must mean substantial changes and material sacrifices of other desirable characteristics, notably in armor, protection, and endurance. The latest designs are considered to have attained an adjustment which must be preserved—that is to say, if there is to be an increase in the caliber of the guns, the number of the guns must be reduced so as to keep the weight of ordnance in its present relative place. Steaming radius is, of course, increased by the use of fuel oil, and that is one of the several decided advantages which compel adherence to the design on an exclusive oil basis regardless of what may be done abroad.—*Army and Navy Register.*

ALL-OIL BATTLESHIP.—Britain can take credit in the fact that it possesses the first "all-oil" battleship in the world, for the *Queen Elizabeth* will carry no coal whatsoever. We have, says *The Petroleum Review*, a large number of destroyers so equipped, but the *Queen Elizabeth* is the first "all-oil" battleship to be launched, although the American *Nevada* and *Oklahoma* were the first to be designed. The substitution of oil for coal not only gives the ship a radius of action greater by 60 per cent than would otherwise have been the case, but it will also allow a very great reduction to be made in the crew. In a coal-burning ship nearly a half of the complement is made up of stokers, who have to bring the coal from the bunkers to the stokehold, and shovel it in as it is required. In the oil-burning ship, however, the fuel is pumped from the tanks and double-bottoms straight into the furnaces, where it burns fiercely at the end of a spray. The exact difference oil makes to the fighting power of a ship may be seen by comparing the *Queen Elizabeth* with the coal-burning *Queen Mary*. The former is heavier by 500 tons, displacing 27,500, and her speed will be 28 knots per hour. The battleship, however, will have 13½ inches of side armor as against 9 inches, and a broadside of eight 15-inch (15,600 pounds) as against eight new-pattern 13.5-inch (11,000 pounds). The *Queen Elizabeth* wil cost about £2,250,000—roughly, a quarter of a million more than the *Queen Mary.—Journal of Naval Engineers.*

NEW TYPE OF NAVAL ENGINE.—Much interest is taken in the result of the development of an internal-combustion engine of the Nurenburg type, the designs of which have been acquired by the Bureau of Steam Engineering of the Navy Department and which will be constructed at the New York navy yard. The Navy Department paid $32,098 for the plans, which amount includes the license to manufacture. Negotiations conducted by the bureau showed that the Nurenburg type, which promised

to be satisfactory for the purpose desired, was the cheapest obtainable. Another engine might have been purchased, but it would have necessitated spending about $100,000 more for the right to manufacture. Some of the Diesel engine people wanted almost the entire appropriation of $250,000 for the plans that they would supply. Having had some experience with the Nurenburg type and recognizing the advantage that would follow from having a firm in this country familiar with its construction and design, it was decided that it would be advantageous to adopt the Nurenburg engine rather than any of the other types. Of course, it is realized that the Diesel engine has its limitations for naval use. For the battleships the Bureau of Steam Engineering is in favor of the turbine as compared with the reciprocating engine, notwithstanding that at the ordinary cruising speed the economy is somewhat less in the case of the turbine than that of the reciprocating type. As might be expected, the engineers are encountering considerable trouble with some of the turbines, involving delay in repairs. There has been some difficulty with the main turbines of one type and with the cruising turbines of another type—that is, the turbines that are used only for cruising speed and which are thrown out at full power. In several of the destroyers the blades have been stripped from these cruising turbines, but there has been little or no trouble with blading in the larger or full-power turbines of this type. For high power and for speed above twenty or twenty-one knots the expert view is in favor of the turbines.—*Army and Navy Register.*

OIL AND COAL BURNING WARSHIPS.—The First Lord of Admiralty has circulated, in reply to a question, a classified list of warships fitted, or to be fitted, for burning oil fuel only or oil and coal.

The total number of vessels built or building fitted, or to be fitted, for burning oil fuel only is 166. Of these five are battleships—the *Queen Elizabeth, Barham, Warspite, Valiant,* and *Malaya*—16 light cruisers, 109 destroyers, and 36 torpedo-boats.

Twelve vessels are to be fitted for burning oil and coal—nine battleships, one battle cruiser, and two light cruisers.

The completed vessels fitted to burn oil and coal number 67, of which 9 are battleships, 17 battle cruisers, 20 light cruisers, and one destroyer. Seven ships are partially fitted to burn oil and coal.—*Naval and Military Record.*

THE SUBMARINE SALVAGE VESSEL "ANTEO."—A salvage vessel named the *Anteo* has just been designed and built by the Werf Gusto (Firma A. F. Smulders), of Schiedam, Holland, for raising submerged submarine boats. The vessel, which has been constructed to the order of the Italian Admiralty, is illustrated above. She left the builders' yard some weeks ago for Spezia under her own steam, her propulsive power being derived from two compound engines of 800 horse-power.

Deviating from the common type of salvage vessel, this boat has been designed so as to be capable of following the fleet in time of war or during the maneuvers, so that should a submarine boat meet with an accident the salvage vessel would be ready at hand to render assistance.

The vessel has a length of 165 feet and a breadth of 78 feet, so as to give her a high degree of stability. The total lifting power provided amounts to 400 tons, which load can be raised from a depth of over 200 feet. For this purpose two derricking cranes, capable of operating independently or jointly, are installed, each crane having a lifting power of 200 tons. These cranes are so arranged that it is possible to vary the distance between the lifting points from 40 feet to 60 feet, according to the length of the submarines to be raised. The crane jibs can be derricked out overboard, and, having raised the submarine above water, they can be derricked back within board and the load be lowered on deck, which is specially constructed for this purpose.

The winches are driven by two steam engines each of 200 horse-power, and are capable of lifting the load of 400 tons at the rate of over 4 feet per minute. The steam for these winches, as well as for the propelling engines, is supplied by two boilers with a heating surface of 200 square meters—say, 2152 square feet.

In addition to many novelties in her construction, the vessel carries an arrangement which, it is said, can be attached to the sunken submarines without the assistance of a diver, and it is claimed that by its use it is possible to raise the submarine from a great depth—say, of over 200 feet—or from a greater depth than that at which a diver could work. The details of this arrangement have not been made public.

The builders point out that, in addition to the salvage of submerged submarines, for which purpose the vessel was more especially built, she can also be used for clearing up wrecks or for depositing heavy blocks when building piers extending into the sea, which blocks can be carried on board the vessel herself.—*Engineer.*

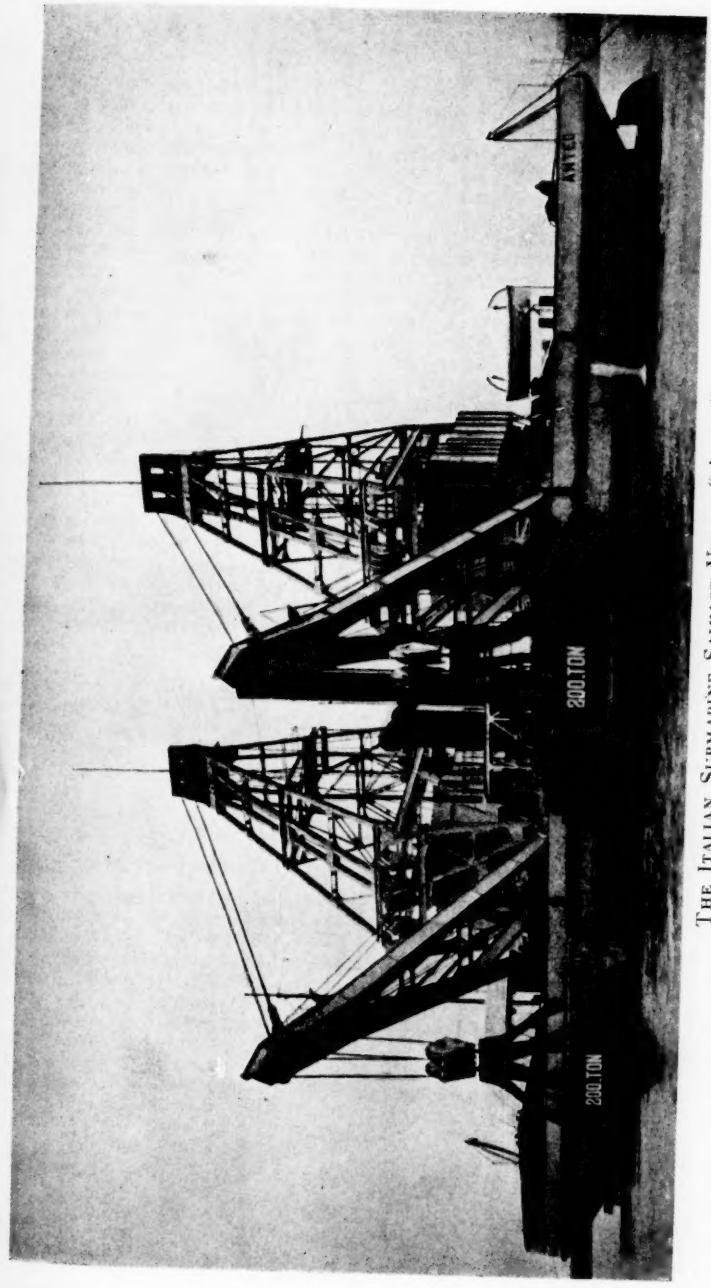
SAFETY OF SUBMARINES.—The difficulty which was experienced in locating the position of submarine *A 7* has resulted in considerable criticism as to why these craft are not fitted with detachable buoys for sending to the surface when a vessel is unable to rise by her own resources. In this connection our attention has been directed to the following report, which appeared in *The Naval and Military Record* about three years ago, and which, in the present circumstances, is considered worth reproducing:

Rewards have been given by the Czar to the entire crew of the submarine *Minoga,* which sank off Libau, when the fate of the crew hung in the balance for nine hours. Some of the men have also received promotion.

The St. Petersburg correspondent of *The Morning Post* writes:

"The *Minoga,* which was apparently proceeding either well on the surface or just awash, was suddenly observed by those on the tender to take a plunge in somewhat abnormal fashion, throwing her stern well into the air. For some time it was not supposed any accident had happened, and the return of the submarine to the surface was expected, but the appearance of the emergency buoy gave the alarm. These buoys not only serve precisely to locate the whereabouts of a sunken submarine, but are fitted with telephonic apparatus enabling the crew to communicate with the upper air. The moment the tender learned by these means what had happened she steamed off to the lightship, which telegraphed the news of a disaster to the dockyard headquarters at Libau.

"The accident happened at three in the afternoon, but owing, it would seem, to the dispersal of the men on a Saturday the message was not acted on for several hours, and it was not until nine at night that the salvage vessels reached the spot. The weather conditions remained happily favorable, and divers having fixed the lifting chains the *Minoga* was successfully brought to the surface by midnight, having been nine hours at the bottom of the sea. When the after hatch was opened three men staggered out, barely able to crawl. Fifteen of the crew and the captain were got out unconscious from the after-part of the vessel. There remained only the coxswain, who was in the conning-tower amidships. It was necessary to raise the submarine well out of the water to get at the conning-tower, and this took another three hours work, but the coxswain, when reached after twelve hours confinement, was in the best condition of any of the crew. Thus the whole command of twenty men was saved and the submarine recovered after lying nine hours at the bottom of the sea helpless. This constitutes a record for submarine work. It is due chiefly to the fact that the depth of water at the spot where the accident happened was only seven fathoms and also largely to the facilities for salvage work afforded by the emergency buoy. No time was lost in sweeping to discover the whereabouts of the sunken vessel, and it may be surmised that the means of communication by telephone with the surface helped not a little while they retained consciousness to keep up the hearts of the poor fellows doomed apparently to a horrible death.



THE ITALIAN SUBMARINE SALVAGE VESSEL "ANTEO"

"The cause of the accident has been ascertained to have been a defective ventilator."—*The Naval and Military Record.*

INVENTION FOR ESCAPE FROM SUBMARINES.—At the present time, when attention is focussed on the dangers to which the crews of submarines are exposed, an invention by Mr. Arthur A. Fownes, of Cardiff, deserves special examination. It is stated to offer a practicable means of escape for the crew of a submarine boat should she get into difficulty. Mr. Fownes has no intention of securing letters patent for the invention, which consists of a kind of baby submarine placed on the top of its parent, and astern of the conning-tower, so as not to interfere with the resistance of the vessel, whether submerged or awash. The smaller apartment fits easily on to the deck, and is closed in every way, with the exception of a hatchway leading into the vessel below, and another at its uppermost part, the former having a door immediately above a similar one in the back of the submarine. When an imprisoned crew desire to leave the damaged vessel they open the door above them and also the bottom door leading into the escapement chamber, closing both doors after them, and leaving the submarine empty, the door above them being, of course, closed. They are then in the smaller vessel, which is quite large enough to obtain sufficient flotation to enable it to rise to the surface, windows being provided for observation and a water gage to enable the crew to tell when they are above water, when they open the top door and escape as best they can. Mr. Fownes has a very ingenious arrangement of release to enable the men in the escape compartment to unscrew the holding-down bolts that keep both vessels together without allowing a particle of water to enter either of them when these bolts are unscrewed. The description of this possible means of escape from a watery grave leads us to hope that the Admiralty will arrange for a thorough test of its capability. It is very evident that it is no use relying upon lifting apparatus for saving the lives of imprisoned crews.—*United Service Gazette.*

SUGGESTION FOR SAVING SUBMARINES.—A correspondent has furnished us with a description of his plans for saving the crew of a submarine that has sunk. It consists of an annular tank carried in a depression around the hatch of the submarine, to which is connected a coil of air hose. The tank can be released from the inside of the submarine, when it will rise to the surface and provide a means of supplying air to the crew and even of forcing down sufficient air to expel the water in case of damage to the hull, thereby enabling the submarine to be floated to the surface.—*Scientific American.*

The development of the submarine flotilla of the French Navy and the tragic sinking of two of these boats several years ago have made the search for an effective means of speedy salvage of much interest in France. Several inventions in this line have been brought forward recently. The latest is that of two engineers, Pelliccioni and Bedour, with which experiments have just been made in the port of Havre. The apparatus is, first of all, an automatic grapple, which can be directed by a special device and along a cable upon a top with which the submarine is equipped. Several apparatus can thus be sent down and when the teeth of the grapples, the crown of which can hold as many as 10 chains, are fastened securely on the different tops it remains only to raise the wreck with the hoisting machinery. It was by this process that the long boat sunk in the outer harbor of Havre was raised with ease December 18.—*Scientific American.*

AVIATION

BRITISH ROYAL FLYING CORPS.—Flying in the R. F. C. has reached such a standard that weather makes no difference to premeditated flights, and it would have silenced the most rabid critic of naval flying to have seen the Eastchurch contingent recently carrying out cross-country reconnaissance in a full gale with a temperature below freezing, in a hail and snow storm to make matters worse. Such work is being done at every base of the flying corps, and the type of flyer required is a man capable of such work, master of his machine and himself. So the R. F. C. can rest on the laurels of its useful work and leave trick flying to those for whom it provides a living.

The appointment of Mr. Harris Booth to the Admiralty as technical adviser, will be welcomed by all who know him or of him, for a better man for the post can hardly be found. A brilliant mathematician, Mr. Booth combines with his theoretical knowledge of aeronautics, which is very deep indeed, a wide practical experience gained during his association with Mr. Alec Ogilvie, the well-known Wright pilot and experimentalist in aerial phenomena at Eastchurch, and from his own experiments. His appointment is one more step toward the goal the Naval Air Department is so rapidly making for—efficiency.

It is worthy of comment that M. Marconi is shortly to test at Hendon his most recent appliances for transmission and receiving of wireless messages from an aeroplane or airship. Much has been done to perfect such an apparatus in the flying corps and progress beyond imputation has recently been made. Therefore, the result of M. Marconi's experiments are looked for with special interest, accentuated by the friendly rivalry that has so long existed between the Marconi Company and the naval wireless experts.

The execution of Mr. Masson as a spy by the Mexican Federals gives the Royal Flying Corps furiously to think. Mr. Masson was acting as a scout for the Constitutionals and was captured by the opposing forces when on a scouting trip. Subsequently he was executed and his execution raises the question of his standing for an air scout. Whether or not he was accounted and commissioned as an officer of the Constitutionalist Army does not appear to affect the question. He was known to be acting against the Federals and did his work openly. So his execution is an outrage against the international laws of warfare and surely the powers will take up the matter and by convention define clearly the position of the air scout. A spy's death is an unpleasant way of "shuffling off this mortal coil" after risking one's neck daily for years.—*Naval and Military Record.*

SEAPLANE WITH GUNS AND WIRELESS INSTALLATION.—A new seaplane is being built for the Admiralty by the Sopwith Company which, it is claimed, will show a very considerable advance on any flying machine at present possessed by the naval service. It is of quite unusual dimensions, the measurement from tip to tip of the wings being 80 feet. The other parts are on a similarly generous scale, the special aim of the designer being to enable it to carry a wireless installation with the widest possible range and a quick-firing gun. It will thus have seating accommodation for three men —a pilot, a wireless operator, and a gunner. The gun is placed in the front part of the seaplane, and the pilot and wireless operator behind. There are two 120 horse-power Austro-Daimler engines, giving 240 horse-power, and a special auxiliary engine will be carried to drive the wireless apparatus. It is expected that the new seaplane will be ready to undergo the Admiralty tests in about a month's time.—*Naval and Military Record.*

SEAPLANES AND THEIR USES.—The popularity of the seaplane is fast gaining ground among naval officers in command of British men-of-war. The Admiralty have kept their secret well, but it is believed that the work of the naval air pilots was much more important and valuable at last summer's maneuvers than has been allowed to leak out. Not only have they now

proved their great utility in "spotting" approaching submarines when submerged, where the sea is clear—at the mouths of rivers and in the estuaries this, of course, is impossible owing to the muddy state of the water—but it is possible that in the near future seaplanes will be armed with machine or pom-pom guns. A flock of these man-birds, hovering at a safe height over a fleet of transports disembarking troops, would be in a position to deal out severe punishment to a raiding or invading army, for a perfect hail-storm of lead and iron could be poured on the transports and the troops in the boats and on the beach, when being placed ashore at what might otherwise be a very secluded and safe spot. Thus the seaplane can be counted upon to assist materially as an aid to the army in destroying a raiding party, as well as becoming naval eyes to spot its approach. The impression that seaplanes can be generally useful to the senior service is so broadcast that several naval captains, commanding large ships, have, it is said, applied to have a seaplane attached to their ships. This request is not likely to be complied with just at present, as the question of stowage has not yet been solved, but it shows how much the seaplane is believed in by the officers of the navy.—*United Service Gazette.*

ARMY MEDICAL AEROPLANES.—*Conveyance and Treatment of Wounded.*—Lieut. Colonel J. F. Donegan, of the Royal Army Medical Corps, lectured recently at the Royal United Service Institution on the uses of aeroplanes to the Army Medical Service in the field. He said that not long ago an expert of experience told him that he considered that before long airships would be used for the transport of detachments of troops on the field. When that was possible he had little doubt that they would be available for the removal of wounded who were able to sit up, having due regard for the rapidity with which aeroplanes could act, as compared with vehicles confined to roads, and also the fact that they could proceed regardless of roads or bridges; neither should they hamper or delay troops moving in a different direction. Provided with the required amount of stability, they would be equally useful in savage as well as European warfare. As regards the use of aeroplanes scouting for wounded on the battlefield, he could not at present realize their element of utility. From his experiences of war he had never found it particularly difficult to locate wounded by day, but it was very difficult at night-time. If aeroplanes were likely to be of use at night in this respect it should be presumed that they were fitted with a searchlight and wireless telegraphy installation, but the rate at which they travel was likely to be misleading. Distances in miles were quite accurate enough in many instances for marching troops, but when it came to the question of the helpless and disabled even yards counted.

At the close of his lecture Colonel Donegan, by means of lantern slides, showed the working of an aero operating table.

Col. H. S. Massey quoted the opinion of M. Maurice Farman as to the practicability of constructing aeroplanes capable of transporting four wounded men in a lying position, and described experiments made at the recent French maneuvers with a flying search corps employed to indicate to the ambulance corps where the wounded were lying.

Brig. General F. G. Stone, R. A., expressed the opinion that when the military authorities came to the conclusion that the science of aviation had reached the point when it was practical for the Army Medical Service to be assisted by aeroplanes, field ambulances should be supplied with such aeroplanes as might be considered necessary, as it would be extremely undesirable for the Army Service Corps to have to rely on aeroplanes from other sources. He doubted very much whether any army in the field would take the risk of allowing any aeroplanes by means of which very valuable information might be obtained to fly over their position.

Lieut. General E. C. Bethune, who presided, expressed the view that Colonel Donegan had made out a very good case for his proposal, which would not only be the means of doing a great deal of good in the cause of humanity, but would have the effect of clearing away a certain amount of

traffic which was not actually connected with the fighting troops. He insisted that there ought to be a sufficient number of aeroplanes of the proper type for the supply of the medical service, as well as the fighting service.—*Army and Navy Gazette.*

BRIGADIER GENERAL STONE ON BOMB-DROPPING.—Brig. General F. G. Stone, of Devonport, commanding royal artillery, southwestern coast defences, gave a lecture on "Aerial Bombardment," under the auspices of the Scottish Aeronautical Society, at Glasgow.

General Stone said that there had been much loose talking and writing on the subject of aerial bombardment during the last three or four years, considered from many points of view. His object was to define as closely as possible the limitations of such bombardment, and the means at their disposal for opposing or preventing it. Aeroplanes had already been employed in war for the purpose of discharging bombs, but the experience of the Italians in Tripoli and subsequent experience in the Balkan war did not lead them to anticipate that the use of explosive or incendiary bombs by aeroplane was likely to develop on an extensive scale, but rather that it would be restricted to attempts to stampede horses and to create a certain amount of confusion by moral effect rather than by destruction to personnel or material on an appreciable scale. Doubtless this method of warfare would be usefully employed in dealing with semi-civilized foes, and there was a very possible field for its employment with a specially designed bomb against fabric or shell of dirigible. Probably the most valuable employment of aeroplanes for discharging bombs would be in the attack on hostile airships, but although experiments were being made in this connection, it was too early yet to say whether such a method of attack would be successful. In any case, the greatest measure of success could only be obtained by attacking the hostile airships in daylight before they were near their objective, which in all probability they would attack after dark. For this purpose it would appear essential to have a large number of scouting aeroplanes with a wide radius of action continuously employed round our coasts, or in the case of the field army, in advance of the general line of advance or defence, as the case might be. The wear and tear both for men and machines would be enormous.

Alarming Prospects.—When they came to consider the possibilities of bombardment from airships they had to face a very different problem. Airships were now in commission which were capable of discharging explosive or incendiary bombs up to a weight of several thousand pounds, and there could not be the slightest doubt that in a war between great powers, well provided with such vessels, they would be successfully employed in the destruction of material on a scale which would directly influence the source of a campaign or a siege. Their objectives would be bridges, docks, ship canals, magazines, dockyards, and possibly ships of war. The actual height from which a bomb could be safely dropped without risk of serious damage to the structure of the airship from the concussion was a matter which could be ascertained to a nicety by experiment. Naturally the airship would come as low down as safety precautions would permit, and under this head the possible action of artillery on the ground must be reckoned with. It was not generally understood, however, that an airship flying low at night was less easy to spot than one which was flying high, and however perfect the artillery arrangements for shooting at an air target by night might be he could not honestly say that he thought the airship had much to fear. Candidly, our means of protecting ourselves against such attacks were not reliable, and it was difficult at present to see how they could be made sufficiently reliable to ward them off. They might note with satisfaction the recent announcement that the British Government had purchased three more Parseval airships to be stationed on the east coast under the Admiralty, though it would be premature to suggest how these airships, which would doubtless give us warning of the approach

of hostile airships, could actually prevent a superior vessel or vessels from effecting their purpose. It might be hoped that The Hague Conference this year had introduced an article into the convention regulating the laws and customs of war somewhat to the following effect: "That no bombardment of any sort, whether by land or sea, or from aerial vessels, shall be permitted against any place or locality except for the purpose of destroying its defence or defenders or the war material contained within its boundaries." In the absence of any evidence to the contrary in the history of civilized warfare within the last century, we were bound to assume that all first-class powers would honorably adhere in the future as in the past to the rules which they had accepted as binding in the conduct of military operations in respect to the civil population. When two nations were at war they opposed each other with their recognized naval and military forces, and did not war on the civil population. The right to fire a shot in the defence of one's hearth and home and country could only be acquired by enrolling oneself in the defensive forces of the country, and thus obtaining the honorable recognition which soldiers of all nations extended to each other in war.—*Naval and Military Record.*

ANTI-AIRCRAFT GUNS' DEADLY ACCURACY.—Some remarkable shooting took place recently at the Needles Battery, Isle of Wight, with the new aircraft-destroying quick-firing guns. About 20 rounds of shell, presumably shrapnel, were fired at three large box kites towed at a great height and speed by the destroyer *Nubian*. The shells gave off a trail of smoke showing their direction, and the shooting was splendid, shell after shell bursting with deadly accuracy amidst the kites, two of which appeared to be shattered. Several military officials and gunnery experts watched the firing.—*Naval and Military Record.*

IMMENSE SHED FOR AIRSHIPS.—The First Lord of the Admiralty, in every speech made on naval affairs in the past few months, has referred in unmistakable terms to the immense need of an air fleet, including airships, aeroplanes, and hydroplanes, the current number of *Engineering* points out, and he has indicated very clearly his determination to ensure that these will be provided in adequate numbers for the navy without delay.

There is now under construction by the Vickers Company (which is carrying out important experimental work), in Walney Island, opposite Barrow-in-Furness, an immense shed for housing the largest models of airships built by the firm, while at Cavendish dock there is a building in which the work of constructing and testing the balloons will be carried on. The machining of the constructional parts of the airship will be carried on in the naval construction factory, and the whole of the assembly of the parts and the erection of the airship will proceed in the new shed at Walney Island.—*Naval and Military Record.*

THE STABILITY OF AEROPLANES.—In these days of aerial gymnastics, or "stunts" as they would be termed in America, the question of the righting possibilities of an aeroplane has additional interest over that which is possessed when pilots were less venturesome. In the early days of modern aeronautics the idea that many of the simpler phenomena were capable of logical explanation was laughed to scorn. The new development, with a few exceptions, had got into the wrong hands. At that time Professor Bryan was working these matters out mathematically. He was severely criticised by men who represented the actual aviators, and who refused to believe that the complications met with in practice were capable of rational analysis. Professor Bryan started with the simpler problems, but subsequent work has carried the matter much further, and Mr. L. Bairstow, in a paper read before the Aeronautical Society of Great Britain, gave a demonstration of the value of this kind of work in practical aeronautics. Mr. Bairstow's paper was entitled "The Stability of Aeroplanes," and he stated that by means of analytical treatment, on Professor

Bryan's or Mr. Lanchester's methods, aeroplanes can be produced either inherently stable or having unstable characteristics of any particular kind. The author described a stable aeroplane as one capable of recovering its correct flying position and speed when the pilot left it to choose its own course, provided sufficient height from the ground were available. The question of self-correction might be divided into two parts—namely, that dealing with machines of inherently stable design and that of machines provided with some mechanism providing automatic stability. It was then demonstrated that a properly designed aeroplane, provided, in addition to the supporting surfaces, with vertical fins above the planes, would recover its normal flying position whether launched upside down or sideways. It was possible to take into account, in the mathematical treatment, the question of gusts, which was merely analogous to side-slipping, which the analysis allowed for. A stable machine must turn into the wind, and as the stability increased this movement would become rapid, perhaps to the discomfort of the pilot. Longitudinal stability was of three kinds. The first, "catastrophic instability," had been treated by Mr. Lanchester in his paper before the last meeting of the British Association. The second was due to rapid oscillations, in which the tail and head tilted alternately up and down. These usually died down, but in extreme cases might cause the aeroplane to turn over and over. The third class, known as phugoid oscillations, caused the aeroplane to move in a vertically wavy path of oscillations of long periods—about 20 seconds. This effect could be reduced by using a sufficiently large tail-plane and elevator. If the tail were not large enough, the amplitude of the wave would increase and end in a too sharp descent. These points were well illustrated by mica models of planes with and without tails and fins. Longitudinal stability could be easily attained by alteration of the tail-plane. It was associated with the principle of the upward vee, in which the forward plane was more heavily loaded than the rear. Lateral stability was more difficult to secure. If a model with a vertical tail fin rolled, the tail turned the machine into the wind. Rolling might also be set up which might result in a progressive increase of the tilt until the aeroplane took a steep spiral path, from which it could not recover. Such instability arose from the use of too large a rudder. The proportioning of the rudder and vertical fin system was one of the most difficult problems. If a machine were spirally unstable, it might be remedied by deepening the body forward of the center of gravity or by increasing the dihedral angle with other corresponding changes. The author suggested that a machine should be made partly inherently stable, the rest being provided by control, with the ability to cut the inherent stability out when necessary—as, for instance, in flying in gusty weather or landing in a confined area.—*Engineering*.

AN IMPROVED HYDROPLANE.—Although the British Army needs all the aircraft which it is possible to get from the manufacturers until its full needs are completed, it is our naval needs, in this new method of attack and defence in war, which a great maritime country like our own must treat as most urgent. Naval aircraft now enter very largely into the system of coast defence, and the seaplane stands to play such an important part in any war with an European nation which may be forced upon us, that considerable sacrifice should be made to get and keep the lead in this class of war weapon. Happily we are at the moment as strong—many think stronger—in this direction as any other power in the world, and naval officers are straining every nerve to further increase our seaplane efficiency. There have recently been some very satisfactory trials in Wales of a new hydroplane invented by Lieutenant Burney of the British Navy. This hydroplane has two screws, one for use when the machine is in the air and the other for use when gliding along on the water, which it is capable of doing at a very high rate of speed. A number of aluminium keels enables the hydroplane to successfully ride a sea in heavy weather, which no other

craft of this kind has been able to do, and this, obviously, is a very great advantage to a naval aircraft of this double-barrelled description. The machine was built by the British Aeroplane Co., and is looked upon as likely to give, after some minor alterations and adjustments, a great advantage to our naval air-pilots over those of other nations. Lieutenant Burney is, we believe, a relative of Vice Admiral Sir Cecil Burney, whose flag flies in our home fleet.—*United Service Gazette.*

DEVELOPING THE BRITISH AERIAL FLEET.—Developments in the arming of aircraft appear to be more rapid even than many of the experts in our air service had anticipated. The Admiralty are pushing ahead in this direction at a brisk pace, and the Naval Wing of the Royal Flying Corps are on the point of accepting a leviathan flying machine from the well-known Sopwith Company. This huge sea-bird is to measure 80 feet from tip to tip of the wings, and so will have great weight-lifting capacity. The machine is designed to carry not only a wireless installation, with a considerable range, but also a quick-firing gun, although the caliber of the gun is not stated—at most it is probably no larger than a 2-inch pom-pom or a machine gun of lighter build. This will mean that at least three, and perhaps four, men will form the crew of this novel aircraft, since there will be the pilot, and a man to work the gun, a man to work the wireless outfit, and possibly an observer. The pilot is to occupy a medial position; the wireless operator will be stationed astern, together with the gun operator. The wireless man will also have to attend to the auxiliary engine fitted to the apparatus under his care. The machinery for flying purposes will consist of two 120 horse-power engines of the Austro-Daimler type. So in this machine we have the first real air-cruiser of the British aerial fleet. Armed airships have yet to be introduced, but they will be looked upon as the battleships of our aerial fighting force.

NAVAL AIRMAN KILLED.—A gloom was cast over the work of the naval air service by the untimely death of Flight Commander Acting Captain G. V. Wildman-Lushington, R. W. A., as the result of a side-slip too near the ground. This is the first time a naval airman has lost his life when flying on naval service, and this very fact is a testimony to the great care and precision prevailing in this the newest branch of naval development. Captain Lushington was not only one of the best known of the naval pilots—he had frequently flown with the First Lord and taught Mr. Churchill how to fly himself, the First Lord actually taking control on one trip—but, had it not been for the exigencies of the service, he would have been one of the pioneers of flight in the Naval Wing, and he was an officer of great technical capacity and determination.

GIANT FLYING MACHINE.—The Admiralty will shortly accept delivery from the Sopwith Company of a giant flying machine, measuring 80 feet from tip to tip of the wings. The other parts are to scale, and the machine is designed to carry a quick-firing gun and also a long-range wireless installation. There will be a notable departure from previous practice in that the pilot is to occupy a medial position. Immediately forward will be the gunner in charge of the quick-firer, and the wireless signaller will be astern and will have charge of the auxiliary engine to drive the apparatus under his especial care. The main machinery for flying purposes will be of 240 horse-power, consisting of two 120 horse-power Austro-Daimler engines.

TRICK FLYING DISCOURAGED.—Let it just be said that "trick flying" is discountenanced and discouraged in the R. F. C., and the budding aviator at the Central Flying School, or Eastchurch, who early displays a tendency for "aerobatics" receives very summary justice. By trick flying is meant vertical spirals, extraordinary steep climbs, sharp banked turns near the ground, and intentional side-slips downwards, and it is well that such are discouraged, for not only do they serve no good purpose, but they sooner

or later end in disaster. On the other hand, pilots are encouraged to get up high and practice handling their machines until they can "twiddle them round their fingers."—*Naval and Military Record.*

BRITISH LEAD IN SEAPLANES.—Not long ago attention was drawn in Germany to the remarkable progress made by the Naval Wing of the British air service, the development of which had up to then passed almost unnoticed by the public in this country. Three years ago the navy's aircraft included naval airship *No. 1*, then in the completing stage, and no aeroplanes at all. To-day we have the First Lord's word for it that we lead the world in seaplanes, and we are at last, after many set-backs, making some headway with airships, of which there are at least fourteen built or building.—*Naval and Military Record.*

AERIAL RECONNAISSANCE.—During the actual days of maneuvers last year our aeroplanes flew an average of, approximately, 800 miles, and the detailed results of the reconnaissances showed that very little had been missed. Transport and guns disguised as travelling shrubberies were not generally difficult to "spot" on the march. Night work, to which considerable risk was still attached, at present lay in the scope of the aeroplane, which could for certain fly for fourteen hours with two engines and fuel for this period. One of the best methods of transmitting information from aircraft would undoubtedly be by wireless telegraphy.

Aerial reconnaissance would be opposed in the air, though anti-aircraft guns would assist. Would there be a battle squadron or a fast scout flotilla to hunt down and destroy airships and to attack aircraft bases? Would there be a low-flying armored destroyer of ammunition parks and supply trains, a heavy transport convoy craft, a breakdown and repair craft? For all those duties slightly different types and qualities were required. Mobility and readiness for instant action at any time must be the essence of being of a flying corps. Command of the air would undoubtedly be sought, and it would as undoubtedly be difficult to obtain.

Captain Waterlow, taking part in the discussion that followed, said in the last maneuvers they sent out wireless messages which were received by the general seven minutes after being despatched, although they had to pass through the censor at the receiving-office and be retransmitted by telephone. Wireless messages were also received on the airship, a feat which, he believed, had not been done in any other country. Airships were going to be factors in the future, and their size would be such that beside them the present Zeppelins would be mere child's play.

General Henderson said that when our enemies had fighting aeroplanes to chase ours and fight in the air, the advantage in speed of certain aeroplanes might have a very great effect on warfare. At present there was no efficient fighting aeroplane that was going to stop a good scout.—*Naval and Military Record.*

BRITISH FLYING DISASTER.—Profound regret is felt at Farnborough at the mishap to the aeroplane of Mr. Ronald Kemp at Chichester, which resulted in the death of Mr. E. T. Haynes, son of the late Commander Haynes, of royal yacht renown, who was a passenger on this ill-fated journey. What went wrong with this huge bi-plane we may find out if the pilot's life is spared. Hopes were entertained that it would prove useful for the carrying of a light gun, wireless receiving apparatus, or first-aid been bought by the government. It was one of the late Mr. Cody's ideas equipment. If the trials had proved satisfactory the machine would have to produce something of this kind, and his failure and lamented death is considered to be partly due to the fact that he worked, as a pioneer, by experience and rule of thumb rather than by scientific calculation. There is apparently much yet to be accomplished even by the most advanced in the art of flying.—*Naval and Military Record.*

NEGLECT KILLED AVIATORS.—*Carelessly Filed Rudder Post Cause of the British Disaster.*—An inquest held March 13, 1914, into the deaths of C. R. W. Allen of the Welsh Regiment and Lieut. J. E. G. Burroughs of the Wiltshire Regiment, who were killed at the military aerodrome on Salisbury Plain March 11, has caused a sensation.

Expert testimony adduced was to the effect that the collapse of the aeroplane in which the two men were flying was due to a broken rudder post, which was weakened by having been "filed carelessly" by some person. Major Brooke-Popham, commandant of the flying corps at Salisbury, declared that, if the finding of the inquest was true, some one was guilty of criminal negligence.—*New York Times.*

AEROPLANE ENGINES.—Turning to the plant required for propelling the aeroplane, we note with something like dismay, the ever-increasing demand for higher and still higher-powered engines. Two or three years ago 50 to 75 horse-power was thought sufficient. To-day machines equipped with motors, such as the twenty-cylinder, 200 horse-power Anzani, are not uncommon. In so far as this increase means an augmented reserve of power, it is all to the good from the military point of view, for here questions of running expense are of very secondary importance, and a wide range between the highest and lowest speed of the machine is everything. But from all other standpoints than that of warfare, this trend towards higher powers only confirms us in our opinion that the aeroplane, for some time to come, at least, will remain a military, and not become a commercial, means of transport.

While it is true that the Gnome radial rotary engine and its numerous imitators still hold the field for popularity, it is also true that the stationary water-cooled motor, the aerial development of the motor-car engine, is steadily gaining in favor. Nor is the reason far to seek. The rotary motor is extremely wasteful of oil and fuel, while the other type is by comparison highly efficient. Indeed, with the length of flights now attempted—such as that made during November by Captain Longcroft and a passenger, who flew with but one stop from Montrose to Portsmouth and then to Farnborough, a total distance of 630 miles, in 7¼ hours—the weight saved by the use of a rotary engine is practically discounted by the weight of the extra oil and fuel required.

That the ordinary type of engine is more trustworthy as well as more efficient than the radial rotary air-cooled type, seems, too, to be the lesson of the aeroplane motor competition held in Germany towards the close of 1912. Of the seven air-cooled engines entered, only one succeeded in passing the main seven hours test, and did so only on its second attempt; while of the thirty-six water-cooled engines, seventeen passed without trouble. It will be interesting to see whether this verdict is supported by the results of our own naval and military aeroplane motor competition to be held in April.

Into the progress which has been made in the design and construction of aeroplane engines, we cannot go at any length. Developments have, however, been extensively made, both in the details of the motors and their general design. The general trend is still towards the production of a light-weight motor occupying a small space and developing a high power with a good efficiency. In view of the fact that machines capable of lifting several passengers are now being regularly constructed and flown, it is somewhat surprising to note that the demand for lightness in the engine plant is still as keen as, if not keener than, ever. Yet we are positively assured that such is the case. It would appear, in fact, that aeroplane builders, while thinking nothing of adding pounds to the weight of their machines in the shape of luxurious upholstering for the pilot's and passenger's seat, and similar items, insist upon every possible ounce being saved in the weight of the motor.—*Journal American Soc. of Naval Eng.*

RECENT IMPROVEMENTS IN AEROPLANE DESIGN AND WHAT THEY MEAN, by C. Dienstbach.—Although there was seemingly a reason for the complaint that the recent aeronautic "Salon" in Paris showed too little progress, a closer inspection of the fifth of the great French aero shows fails to bear it out. It is true that a weeding-out process has started. The industry has settled down to the practical basis of catering primarily to military requirements, and the number of exhibitors has diminished.

The businesslike apparatus shown gave better proof of real progress than the freaks of former years. While types looked familiar, details of construction had all been developed from long experience in the exacting and practical flying demanded by the military authorities, and designs showed the work of the modern aero-dynamical laboratory. This stamps as "practical" some entirely new departures, which looked too modest to command widespread attention, but were really of singular importance. Although inspired by military demands, they will eventually go far in commercializing the aeroplane by making it safer. Thus, an 80 horse-power monoplane (*De Beer*) and a 160 horse-power biplane (*Paul Schmitt*) were each provided with a perfected mechanism for changing the angle of the planes with the line of the propeller thrust and the fuselage during flight, for the purpose of being able to fly very slowly while making minute observations or dropping bombs and landing on difficult ground. Although any aeroplane can change its angle of attack by operating the horizontal rudder, this primitive method changes the line of the propeller's thrust just as much. The "slipstream" is then turned into a strong descending current which disturbs the normal action of the planes and rudders and impairs their lift. While the propeller itself becomes somewhat lifting, more harm than good is done, because at the steep angle of the planes every ounce of thrust is needed for propulsion. If fast flying did not waste so much power in overcoming the head resistance of struts and wires, which becomes clear gain with that resistance diminishing out of all proportion while flying slowly, the English War Office's prizes for moderately reducing the speed at will could never have been won by the machines competing. (Even the Gordon-Bennett aeroplane race is now open only to such fast machines as can likewise cover a slow lap around the course.) With the new arrangement, a speed range of from 19 to 75 miles an hour is claimed for the big biplane.

In landing, the advantage of this arrangement is very obvious. At present the speed must be checked at some altitude when it is still needed for fighting the treacherous gusts of the lower air and in steering around obstacles. It cannot be checked instead just before touching ground (as the birds do) because the long fuselage is in the way. Nor can the machine's rolling after touching be quickly stopped without danger of a somersault while braking on the wheels or on the ground. The new arrangement, supplemented by a reversible propeller, permitting intense aerial braking, would easily provide for birdlike landings on any circumscribed area.

It is most significant that the famous designer of propellers, Chauvière, has brought out a propeller, the pitch of which can be changed during flight. It is only a matter of degree to make it entirely reversible. But before slow flying can reach its full development adjustable planes must be supplemented by changing the propeller's pitch, as actually provided for by Chauvière. It is a well-known fact that a motor never develops its maximum number of revolutions while the machine is held stationary on the ground, yet could do so if the propeller's pitch were reduced for so long. The pitch must likewise be reduced lest the motor should become powerless in urging the machine against the excessive resistance of the steep planes. Even so, it needs a reserve of power, but surplus power is now so clearly recognized as a necessary condition of fighting the vicissitudes of the air with the primitive machines of to-day, that not a single French aeroplane now lacks a large margin of it. The new arrangements will rather tend to decrease the needed amount. They include also a larger size of propeller, lest in flying very slowly the slip should increase unduly. This requires in turn the efficient gear-drive shown in Caudron's large "sea-

plane." One of the "baby" Wright racers of 1910, with its enormous twin propellers, furnished a striking proof of the lifting power of a steep angle of the planes, supplemented by suitable propelling arrangements (behind the planes, beside the tail, and with a slow slipstream these large screws impaired the lift but little) when it established a height record in spite of small surface and was seen to start with the shortest run. Very slow flying obviously also demands enlarged rudders.

The capacity to fly very slowly and fast at will provides more important advantages than the purely military ones. It permits starting with a very short run (little inertia needs to be overcome to raise the machine) and landing almost without any run. An aeroplane capable of starting and alighting on the roof of an ordinary house certainly goes a long step toward attaining the commercial machine of the future. But still better, it will eventually rob "stalling" and the "airhole" of their terrors. In descending currents a steep angle of attack will supply that sudden increase of lift a gull derives from its characteristic "periods of vigorous flapping." Getting more or less "stalled" means nothing to a machine capable of very slow flight, because little inertia needs to be overcome before it can lift and balance again.—*Scientific American.*

GERMAN AEROPLANE MOTOR COMPETITION.—Another aeroplane motor competition is to be held in Germany, the particulars of which were definitely decided at a sitting of the prize court held during January. The sum of £7000 is to be awarded for the best water-cooled and air-cooled motors with a capacity between 80 and 200 horse-power. The applications to participate must be sent in by May 1 and the motors by September 1. The tests, which will be completed by the beginning of 1915, will be of the following nature: In the first place, the general working of the motors will be tested, then the efficiency, consumption of fuel, etc., and finally duration trials will be conducted. Among the points that will be counted in favor of a competing engine, the possibility of using cheap and safe material of German origin will be included; whilst points to be avoided are: long duration of preparations for the tests, special requirements as regards lubricating oil, decline of efficiency in the long distance trials, vibration, breakdown of carbureters, an inconvenient shape for fitting into the aeroplane, and the supply of materials from abroad. The military and naval authorities have declared their intention of purchasing some of the best motors if they fulfil the special conditions laid down for these tests.—*Engineer.*

GERMAN RESTRICTIONS ON FLYING.—The *Deutsche Luftfahre-Zeitschrift* has published a map indicating the districts forbidden to aeronauts. As a general rule these districts extend in a circle varying from 20 to 100 kilometers round fortresses, and include, in addition certain important strategic zones, such as Alsace and Western Lorraine.

UNGER STEEL DIRIGIBLE.—According to the *Jahrbücher für die deutsche Armee und Marine,* the Unger steel dirigible at present under construction will be armed with (a) two 5-cm. guns on a platform in the forepart of the balloon; (b) an apparatus for discharging bombs on the trestle of the airship. The later apparatus, which is similar to that for discharging torpedoes, will contain several projectiles which may be discharged singly or in considerable numbers.

ITALIAN AIRSHIPS FOR THE BRITISH NAVY.—It is reported that the British Admiralty has ordered three Forlanini airships, the first of which will be built in Italy, and the others by an important British firm. The *Città di Milano,* which was built in eighteen months by Signor Forlanini, and has been presented to the Italian Army, the cost having been defrayed out of the national fund of £128,000, subscribed for aeronautics, of which a large proportion came from Milan, possesses many remarkable features. It is semi-rigid, and its car, which is completely enclosed and has windows in front for navigation purposes, forms part of the actual keel, which is a girder braced by a cable running fore and aft through the gas-bag from

end to end. There are two envelopes, the inner being divided into fourteen compartments. The envelopes meet at the top, and are otherwise kept apart by inflated ballonets. The frame is square in section, and is built up of triangular girders. The ship, according to the *Times*, has a displacement of about 12 tons, or 3½ tons more than the *Parseval*, acquired last year by the Admiralty. The length is 72 meters (about 235 feet) and diameter 18 meters (about 58½ feet). The two Isotta Fraschini engines, of 85 to 100 horse-power, drive two three-bladed propellers, 4.20 meters in diameter (about 13½ feet), which are calculated to give a speed of 44 miles an hour. Three guns are to be carried.—*Engineering*.

THE ITALIAN AIR FLEET.—An official commission pronounced its recommendation recently on the principal points to be studied with a view to the better organization of military aeronautics in Italy. The definite separation of the service from the other branches is urged, together with the creation of a Central Aeronautic Institute and the formation of a body of volunteers. The new arm, thus rendered autonomous, would be divided into airships and aeroplanes, each considered as a separate corps and having its own officers. With regard to the units in construction at the military airship yard of Vigna di Valle, the *M 3* is finished and is now beginning her trials, while the *P 3* has terminated these with success and is said to be destined for Turin. These two additions to the Italian airship fleet bring its numbers up to ten, consisting of five of the *P*—piccolo = small—class, three of the *M*—medium—category, the *Città di Milano*, built by Ing. Forlanini, and the *Parseval*. The first example of a new semi-rigid series, distinguished by the letter *V* after the designer, Captain Verduzio, is under construction near Rome, and will have a capacity of 15,000 cubic meters (529,721 cubic feet) and a speed of 90 kilometers (56 miles). In Milan another Forlanini vessel will be soon begun, with a capacity of 15,000 cubic meters, and therefore larger than the *Città di Milano*, besides having greater speed. The plans are also said to be well ahead for the new *G*—grande = large—type, which will be rigid and have a capacity of over 30,000 cubic meters (1,059,442 cubic feet). In the aeroplane department three squadrons of seven machines will be added by June to the sixteen already existing. By the end of the year there will probably be in Italy seventeen military aviation squadrons, each of seven aeroplanes, together with thirteen airships, of which the newest and largest will be the new Forlanini ship, the *V* type unit, and the large *G*.—*Engineer*.

AEROPLANES IN ROUMANIA.—Roumania has realized the great importance of having an adequately equipped aviation corps, the want for which was strikingly emphasized in the recent Balkan War. Of late large contracts have been placed with the British and Colonial Aeroplane Co., Ltd., for the supply of *Bristol* aeroplanes.

In the early part of last year, 12 officers of the Roumanian Army were sent to England to undergo a course of instruction at the "Bristol" Flying Schools. These officers were to form the backbone of their country's flying corps, which they have now taken charge of. Under their instruction a large number of officers have been, and are still, taught to fly.

Besides (devoting or giving) their attention to instructing pupils these officers have put up many cross-country flights. Captain Popovici has made several trips of 200 miles and over, having a passenger with him, and has shown himself to be an accomplished flyer. With Lieutenant Pascanu as passenger, this officer in one of the 80 horse-power *Bristol* tractor biplanes, flew to Botosani and back, a total distance of 750 miles. Lieutenant Beroinade reached an height of 3500 feet on a similar type machine, with full load and passenger, whilst on the following day he took one of these machines up to 12,000 feet, flying on this occasion for upwards of an hour. Lieutenant Pascanu made several fine flights on the same day, two of them being cross-country of a duration of two hours each. On December 21 Captain Popovici set off for a cross-country circuit and covered 83 miles in 50 minutes, with a following wind, being at the rate of just over 100 miles per hour.—*Army and Navy Gazette*.

TRANSATLANTIC BIPLANE.—A very serious attempt is to be made during the course of the early smmuer to cross the Atlantic Ocean in a flying machine. Mr. Rodman Wanamaker, of Philadelphia, in a letter sent to the Aero Club of America, announces that he has commissioned Mr. Glenn H. Curtiss to construct a flying boat capable of making the trip across the Atlantic Ocean in a single flight of from twelve to fifteen hours.

So very little information has been given out as to the design of the aircraft in which this feat will be attempted that it is impossible to offer anything in the nature of critical comment. Mr. Curtiss has stated, however, that "for reasons not at all in accordance with those usually given for such a procedure a tractor screw in front of the machine will be used instead of the propeller usually seen in the Curtiss flying boats." The hull will be of torpedo or streamline form of large diameter, almost entirely inclosed, so that in case of a forced "landing" in mid-ocean it can be relied upon to float for days. In the bow will be installed a motor of approximately 200 horse-power, readily accessible to the two operators. Twelve feet back of the motor will be the cockpit proper, and in it there will be room for the two men to sit down or move about. The controls will be in duplicate so that the machine may be handled by both men in unison, or by either one.

The wings will have a span of about eighty feet and the area of lifting surface will be about 1200 square feet. The latest wings designed by Mr. Curtiss are able to rise from the water with a load of ten pounds to the square foot. Hence the actual lifting capacity of the Wanamaker transatlantic flying boat will be several tons, in other words sufficiently ample to provide for the enormous amount of fuel which must be carried. In outline the wings will be swept back at an angle of some six degrees. They will have a dihedral angle, rising from the center to the extremities to insure a certain amount of inherent stability.

Naturally everything hinges on the motor.

Up to the present time a 200 horse-power motor has not been mounted on a flying boat. To be sure Sikorsky has built four units of 100 horse-power each into his enormous machine. This, however, is not quite the same as concentrating 200 horse-power in the bow of a biplane. Even if the transatlantic flight proves a failure as a voyage, the experiment that Mr. Wanamaker is making deserves encouragement because for the first time light will be thrown upon the engine power required for large machines and on the behavior of very large engines in a regularly sustained flight.

The recent flight of Ingold, who covered a distance of about 1000 miles in 16 hours, as well as the record flight of Victor Stöffler, who covered 1340 miles in 24 hours, would seem to argue that given a perfect motor it is not utterly impossible to cross the Atlantic in 15 hours, in a single flight from dawn to dusk.

It may be questioned, however, whether Mr. Curtiss' expressed intention of having the machine fly at an altitude of 10,000 feet will be realized. The men who have made record altitudes testify to the difficulty of securing good motor compression at heights of 10,000 feet and over. Whatever may be the advantage to be gained by constant winds at that height, will be more than offset by imposing upon a brand new type of motor a difficulty with which even the tried engines of record breakers find it hard to cope.—*Scientific American.*

AMERICA'S NEED FOR AN AERONAUTICAL MOTOR COMPETITION.—If we may credit the reports of progress in aeroplane design, the most serious requirement of aviation to-day is a suitable engine. Inherent stability has been provided in Dunne's invention; automatic stability in Wright's invention; nearly the limit of efficiency has been attained in propeller, wing and body design. When well above the earth, a skilled pilot, in whatever attitude, normal, oblique, or reverse, now feels sufficiently safe. Give the circus aviator a strong, reliable motor; he will perform anywhere, however forbidding the terrain beneath. To strength and reliability add economy, and

the commercial aviator will make the aeroplane pay dividends by performing useful service to the community. What aviation most needs, then, is a strong, reliable, economical engine.

America has many motor firms, but too little exchange of ideas. An engine tournament, a public show of merits is needed. A competitive test of all the best aeronautical motors, followed by a published report, would be most serviceable to builders and users alike. An adequate testing plant, established by the United States Signal Corps, is now available at the Bureau of Standards, in Washington. All, therefore, that is required to launch a first-class competition is a monetary prize, or the guarantee of orders on a showing of merit, sufficient to attract the engine builders.

The *Scientific American* would recommend that a fund be established for a motor competition similar to that recently held in Berlin. The German Emperor offered, from his private purse, a prize of 50,000 marks for the best German aero motor. This sum was, by contributions from the country at large, soon swelled to 125,000 marks, and resulted in a competitive test of two or three score of the best aeronautical engines. Who will emulate the German Kaiser in America?

THE NEW CURTISS MONOPLANE FLYING BOAT

In our issue of August 31, 1912, we commended the movement to establish a national aerotechnical institute. Such an establishment, under direction of the Smithsonian Institution, is now practically realized. It has the co-operation of four departments of the government, including the army and navy, and of various private laboratories and aircraft companies. It, therefore, needs only the approbation of Congress to make it truly national. The Aeronautical Advisory Committee of the Smithsonian Institution is especially qualified to receive and properly administer a prize for an aeronautical motor competition, more particularly since its membership comprises delegates from both the Signal Corps and the Bureau of Standards. We would recommend that the proposed prize and competition be placed in charge of this committee.—*Scientific American.*

THE NEW CURTISS MONOPLANE FLYING BOAT.—In the monoplane flying boat designed by Glenn H. Curtiss for Raymond V. Morris, of New Haven, features will be found that will be both approved and disapproved. In form the hydroplane hull suggests an expensive imported cigar; big at the end between your teeth, flat part of the way on one side, and tapering gently to nothing at the other end. Its principal dimensions are: Length, 22 feet; beam, 30 inches; depth, 36 inches. The bottom, as far back as the

step, is the new double *V* type, found in the new navy boats *C 3*, *C 4*, *C 5*. The bow is pointed instead of square. The holes in the hull permit the entrance of the pilot and, possibly, of one passenger. The pilot's seat is low, both to give him every protection from the wind, and to bring the shoulder yoke at the greatest diameter of the hull. Unless the pilot sits up very straight only half of his head shows above the coaming.

The wings are set about 40 inches above the hull, attached at the top to the welded steel structure supporting the engine bed, and braced below by struts extending to a cross beam which carries the balancing pontoons.

The design of the wings is not unlike that of the European Etrich machine, and suggests a bird's wings. The idea of placing the engine above the wings has been carried out before, notably in the Santos-Dumont machines. The position of the pilot, with such a weight above his head, is obviously dangerous. The total spread of the wings, from tip to tip of ailerons, is 34 feet. The spread of the supporting surface is 28 feet. For 20 feet in the center the chord is 60 inches, while for four feet at each end the main surface is practically triangular.

Rudder, flippers, and rear stabilizing surfaces follow the lines of those used in standard models of the Curtiss flying boats, modified as to size to fit this smaller machine.

The machine was successfully tried out early in January.—*Scientific American.*

NAVAL AVIATION.—An aeroplane for every battleship in the navy, dirigibles in a much smaller number, and the concentration of naval aeronautical work in Pensacola, Fla., are among the recommendations made to the Navy Department by the Board of Naval Officers appointed to draw up a plan for the organization of an adequate American naval aeronautical service. The board that after a long series of consultations finally submitted its findings to the secretary of the navy is composed of Capt. Washington I. Chambers, president, and Commanders C. B. Brittain and S. S. Robison, Lieuts. M. H. Simons and John H. Towers, Naval Constructor H. C. Richardson, and First Lieutenant Alfred A. Cunningham, of the Marine Corps.

The board points out that, while aeroplanes are now recognized as an important part of the equipment of all modern navies, their capabilities are limited in many ways which makes necessary the consideration of the dirigible for uses for which the aeroplane is as yet unfitted. Foreign nations are already making use of the naval dirigible, and it is now the duty of the Navy Department to study the question of dirigibles and decide upon the place they are to have in the United States fleets, the reports says. The purchase of dirigibles at an early date is, therefore, one of the recommendations.

Likewise the board recommends the construction of sheds for the dirigibles, the purchase of hydrogen plants and all other appliances necessary in the handling of dirigibles, and the development of auxiliary ships for their operation with the fleet for advanced base purposes.

As to aeroplanes, the board believes that this type of flying machine should eventually be placed on board of every fighting ship of the first class in the navy and also any groups of other ships engaged in scouting duty or on detached service. The fleet auxiliaries should carry the supplies, stores, and extra parts for the aeroplanes, the purpose being not to encumber to any greater extent the fighting units of the fleets. Eventually, in the opinion of the board, special ships for aeroplanes and other types of flying machines should be considered, although this recommendation is not for immediate consideration.

Pensacola is recommended as the naval aviation center because of natural advantages, such as its splendid harbor, its climate, which is peculiarly fitted to aeronautical work, and its importance as a railroad center. A station ship for Pensacola is also suggested, the ship to be used as a "flying school" for the qualification of aviators in advanced aerial work, and also

for the testing of materials, such as devices for the launching of aeroplanes from ships and methods of hoisting and stowing them on board.

An office of naval aeronautics is also suggested, and the board considers such a bureau absolutely essential to harmonious and rapid progress in the development of the aerial arm of the service afloat. The board also recommends the location of the aeronautic laboratory at the Washington (D. C.) navy yard.

The report is understood to meet in general the approval of Secretary of the Navy Daniels.—*Army and Navy Register.*

RADIO

GERMAN RADIOTELEGRAPHIC STATIONS IN THE PACIFIC.—The first German radiotelegraph station in the Pacific was opened in November, 1909, on Yap (or Uap) Island, in the Carolines, situated about 10° north and to the north of New Guinea. The station was built by the Telefunken Gesellschaft on behalf of the Deutsche Sudsee Phosphat Gesellschaft, which has phosphate mines there, and about 500 km. west on Angaur, which belongs to the Palau Archipelago. Yap is connected with the cable system of the Deutsch-Niederlandische Telegraphen-Gesellschaft (of Cologne) by three cables to Shanghai, in China, to Guam (in the Marianne Islands, belonging to the United States), and to Menado (on Celebas, Dutch East India). For this reason Yap was selected as a radiotelegraphic center, and further stations have now been erected at Rabaul (seat of the governor of German New Guinea, who is also governor of the large Bismarck Archipelago), at Nauru (in the Marshall Archipelago, which extends far to the north of the Equator, while Nauru itself is on the Equator), and at Apia, in Samoa (14° south); a station on the already-mentioned Angaur Island had been built at the same time as that on Yap. The distances worked are considerable. Yap-Rabaul is 2200 km., Yap-Nauru 3400 km., Nauru-Samoa 2700 km., and New Guinea-Samoa 4000 km. The distance Yap Tsingtau (in Shantung, also known under the name of Kiaochow itself is Chinese, while Tsingtau is German, and possesses a radiotelegraphy station and an observatory, and is joined to the Asiatic railway and telegraph system) is 3650 km., almost exactly as far as from Clifden, in the west of Ireland, to Glace Bay, in Newfoundland. The station at Apia is to be opened this spring, the other stations are already working. The stations are equipped with 60 horse-power oil-engines, and with umbrella antennæ 120 m. in height, to work with an energy of 25 kw. or 30 kw., and with waves ranging from 300 m. up to 2000 m.; the ordinary wave-length for signalling to ships is 600 m. Smaller coastal station for T antennæ and energy of 5 kw. are being added. The German Telegraph Department has not proceeded directly in this enterprise. A concession has been granted to the two companies already referred to, the Telefunken-Gesellschaft and Deutsch-Niederlandische Telegraphen-Gesellschaft, which, for building and working these stations, have combined with the Deutsch Sudsee-Gesellschaft fur Drahtlose Telegraphie. The combination was effected in August, 1912, and the service is under the control of an Imperial commissioner. The co-operation of a cable company with a radiotelegraphy company will forestall rivalry between these two telegraph systems. We may supplement this note by a few statements on other radiotelegraphy stations in German colonies, almost all of which are now equipped. In German East Africa there is a coastal station at Dar-es-Salaam, and two stations are at Nuansa and Bukoba, on the Victoria Nyanza. Cameroon has a station at Duala; Togo, one at Toblekohye, near Lome (not yet open) and German South West Africa, stations at Swakopmund and Luderitz Bay. Further stations are contemplated, and an agreement will probably be made with the Netherlands Government as to the question of a station at Sumatra, in the East Indies, to serve as intermediate station between East Africa (Dar-es-Salaam) and the Pacific islands (Yap). The distance between East Africa and

Sumatra would be 8000 km., while the furthest distance, so far covered experimentally at night-time, is Nauen-New York, 6500 km. Nauen and Togo, 5500 km., have communicated with one another at day-time.—*Shipping*, Illustrated.

WIRELESS TELEGRAPHY IN GERMAN COLONIES.—On December 1 the first two of the four Telefunken stations planned for the German Protectorates in the Pacific Ocean were opened for public traffic, namely, that at Jap in the Caroline Islands and that at Nauru in the Marshall Islands. These stations are intended to communicate with each other, the distance between them being 2100 miles. Nauru thus, for the first time, comes into telegraphic communication with the rest of the world by means of the cables which start from Jap. Both stations are fitted with umbrella-shaped antennæ on iron towers 120 m. high. For communication with ships at sea small auxiliary stations have been erected capable of transmitting messages 372 miles during the day and 1240 miles during the night. The two other stations under construction, which are situated at Rabaul in German New Guinea and at Apia on the island of Samoa, are progressing rapidly, and will, in all probability, be completed in the next few months. A Telefunken station is also being built at Kamina, in the Protectorate of Togoland, West Africa, and is already so far advanced that trial messages have been received there from Nauen, near Berlin, a distance of 3350 miles, although the station at Kamina is not yet able to transmit messages.—*Engineer*.

In the Berlin letter attention was recently called to the excellent wireless work of certain German warships, whose installations are reported to be much more efficient than those of British men-of-war. In this connection some further particulars are now published semi-officially. The cruiser *Nürnberg*, attached to the China squadron, but at present in Mexican waters, was able to take in perfectly clear messages despatched from the "Telefunken" station at Nauru, in the Australian archipelago, a distance of 5000 knots, and also received communications from the station at Jap, situated 6600 knots away. Excellent work is also reported from the wireless station at Tsingtau (Kiauchau) dockyard, which has been in touch with ships of the cruiser squadron at a distance of 4000 knots. These are most creditable results, but it is less satisfactory to learn that the wireless apparatus of British ships on the China station is useless at distances not half as great, according to German reports from that quarter of the world.—*Naval and Military Record*.

WIRELESS TELEGRAPHY IN JAPAN.—In almost every department of western science and its applications the Japanese have shown that they are not only able to take full advantage of discoveries, but also to adapt and improve them to suit the circumstances of Japan. Wireless telegraphy very soon attracted their attention, and as early as 1886 Dr. Shida, a distinguished graduate of the Imperial College of Engineering, Tokyo, set up an apparatus of his own construction on the banks of the Sumida River, Tokyo, but his attempts to send messages across the water by means of electric waves were not wholly successful. After European scientists began to publish the results of their investigations and experiments, the Japanese electricians turned again to the subject, and this time with considerable success. Dr. Nagaoka and Dr. Mizuno, of the engineering department of the Imperial University, commenced an exhaustive series of experiments with some very encouraging results. In 1897 Dr. Asano, of the electrical section of the Department of Communications, Tokyo, set up a wireless telegraphic apparatus on the old forts in the Bay of Tokyo, and attempted to exchange messages with a station erected on the reclaimed land at Tsukijima, near the mouth of the Sumida River. Meantime Marconi was making great developments in Europe, and the Japanese electricians learned much from him and other inventors; but they soon developed a system of their own, which is now used in the Department of Communications. This system,

known as the "Teishin-sho" system, is claimed to be one of the best systems in use. As wireless telegraphy was of great importance to the navy, and as it would be a great advantage to have a system different from that used in other navies, the Japanese electricians set to work, and they evolved a special system for use in the Imperial Navy, and it was adopted by the fleet. That system, which is now known as "Kaingun-sho," enables the fleet to preserve absolute secrecy as to position and message. It owes its existence to Professor Kimuna, and was used with telling effect during the war with Russia. It is said that Admiral Togo was able to receive warning of the approach of the Baltic fleet, and be in readiness to meet it when it came in sight, with the result that is well known, so that it is claimed that in the greatest sea fight of modern times, Japan owed her victory in a large measure to the perfection of her wireless telegraphy. To meet the convenience of shipping there are now seven wireless stations in Japan. The stations are so selected that they cover not only Japan proper, but one is in Formosa, and another in Dairen, in Manchuria. The wireless system has been largely applied in Japanese merchant ships, nearly all the Japanese trans-Pacific liners being now fully equipped with wireless telegraphic apparatus, and many of the better class of coasting steamers as well.—*Engineering.*

Engineer-in-Chief Robert S. Griffin, U. S. N., in a statement submitted to the House Committee on Naval Affairs January 22 announced that the Navy Department has changed its proposals for establishing a chain of radio stations to complete wireless communication between Washington and the Philippines. Wireless stations at Guam and Samoa are to be eliminated if possible and high power stations will be located at Panama, San Diego, Cal., Honolulu and Manila. The station at the Isthmus, which will be situated at Darien, will be completed, according to present prospects, in January, 1915. It is expected that the Arlington station will be able to communicate directly with Darien. Recent experiments at the Arlington radio station showed that it was able to pick up messages sent from a Poulsen arc set of radio instruments at Honolulu, and tests recently conducted at San Francisco, with a Poulsen set demonstrated that messages could be sent direct from San Francisco to Washington.—*Shipping,* Illustrated.

NAVAL RADIO STATION IN SAN DIEGO.—The board of naval officers which has been investigating the site for the location of a high-power radio station on the California coast, has selected a site on La Chollas Heights, about four miles east of the city limits of San Diego, and eleven miles from the Pacific coast. It embraces some 74 acres which lie at an elevation of 450 feet above sea level.—*Scientific American.*

WIRELESS 6000 MILES.—*Distinct Messages Passed Between Germany and Cape of Good Hope.*—Communication was held on March 14 between the wireless station here and one at Windhoek, Cape of Good Hope, South Africa.

The messages that passed were clear and distinct.

The distance between Nauen and Windhoek is approximately 6000 miles. At various times there have been reports of messages traveling 6000 miles or more, but very few, if any, of these have been direct communications. March seems to be a favorable month for the making of long distance records. In March of last year the Naval Radio Station at Newport heard two wireless stations in the Argentine Republic exchanging messages, and these stations were said to have been from 7000 to 8000 miles distant.—*New York Times.*

A WIRELESS ACHIEVEMENT.—At Gloucester, Massachusetts, a young man sitting in a lookout station on shore with an electric switch under his hand, aided by a splendid and costly wireless plant with masts 360 feet high, and

by a searchlight of 186,000,000 candle-power (larger than that of a battleship), operates by wireless control a 40-foot boat. It may or may not have passengers aboard, but in either case it can be started, stopped, turned this way and that, made to circle rocks and ships—all without any other human agency than that of the young man in the lookout station.

This young man is John Hays Hammond, Jr., twenty-five years old, son of the famous mining engineer of the same name. His achievement is described by Mr. Cleveland Moffett in the current issue of *McClure's Magazine*. The story records an astonishing chapter of invention, and it also suggests the probability of a notable advance in the possibilities of coast defence and naval warfare. Mr. Moffett says: "Hammond can send his boat out and back along an eight-mile course filled with rocks and shoals and harbor craft, at the speed of the swiftest cruiser. He can aim it at a mark three miles away, and strike with precision every time. From this boat, running by wireless on the water, to a similar boat running under the water, is but a step. When that step is taken we shall have the ultimate torpedo, for which the navies of the world are waiting." Heretofore torpedoes controlled from the shore have carried a slight connecting wire; but currents and tides have made their steering uncertain. With Hammond's system a semi-submerged torpedo may be devised which can be steered accurately from shore at high speed. General Weaver, chief of the United States Coast Artillery, says Mr. Moffett, witnessed the evolutions of the wonderful boat with sensations that "changed from skepticism to awakened interest, then to surprise, and finally to absolute amazement."

The boat has its own engines to furnish power; the control by the wireless waves acts upon a system of receivers and relays and motors in the vessel, each motor exercising some control over engine or rudder. "Thus one turns the rudder to the left, another sets the engines at half speed, another at full speed, while another stops them. The current that operates these motors comes from generators carried by the vessel itself, and not from the wireless station on shore, which merely sends power enough to unlock the motor gates, as it were, by a delicate receiving apparatus, and let the current from the generators flow through."

The exact methods by which this is accomplished in Mr. Hammond's "Radio" are, naturally, kept secret. The results as described in the article from which we have quoted are extraordinary.—*The Week.*

Another wireless triumph was achieved on Wednesday, February 11, when the New Sayville, Long Island, wireless station succeeded in establishing communication with Nauen, near Berlin, a distance of over 4000 miles. The system in use was that of the Telefunken Company, and the signals are said to have been absolutely faultless. The Sayville station belongs to the Atlantic Communication Company, and the messages were despatched from a huge steel tower over 500 feet high. Communication having been established, Mr. Mitchell, the mayor of New York, sent the first message, which was one of congratulation, to the Kaiser. A gracious reply was very soon received from Berlin. Mr. Mitchell then sent greetings to Mr. James Gerard, the American Ambassador in Berlin, and after an acknowledgment had been received the New York newspapers exchanged felicitations with several prominent German journals. There was no hitch of any kind, and the directors and operating staff of the Atlantic Communication Company received hearty congratulations from all quarters. It is expected that this new wireless "route" will soon be used extensively for night commercial messages.—*Engineer.*

WIRELESS ON RAILWAY TRAINS.—Experiments with Marconi wireless apparatus installed on trains of the Delaware, Lackawanna and Western Railroad Company have proved that it is possible for trains so equipped to be in constant communication with stations and each other regardless of the speed at which they are traveling, and have led railway men to predict that the wireless will prove of nearly as much value to land travel as it has been to navigation.—*The Outlook.*

CANALS

LIGHTING THE PANAMA CANAL.—In conformity with Section 4678 of the Revised Statutes of the United States all the buoys in the Canal are colored and numbered, so that in entering the channel at Colon, and extending south to Miraflores Locks, red buoys with even numbers shall be passed on the starboard hand, and black buoys with odd numbers on the port hand. On entering the channel at Naos Island, and extending north to Miroflores Locks, at the Pacific entrance, red buoys with even numbers are placed on the starboard hand, and black buoys with odd numbers on the port hand.

All of the buoys are equipped with floating devices. Buoys on the port side will use double flashes, those on the starboard, single flashes, as follows: Buoys on starboard tangents have a characteristic of five seconds light, five seconds dark; on port tangents, two seconds light and one second dark, two seconds light, 3.8 seconds dark. Turning buoys on the starboard hand have a characteristic of .3 second light, 2.7 seconds dark; on the port hand, .3 second light, .7 second dark, .3 second light, 1.7 seconds dark.

The general custom for channel or river lighting is to have red lights on the starboard hand and white lights on the port hand, but with the perfection of devices which produce rapid flashes of whatever duration desired, it is likely that this method will eventually be superseded by the method of single and double flashes of white light on either side of the channel, especially in localities frequented by heavy fogs and rains, where the maximum efficiency of a light is required. To obtain a red light it is necessary to use ruby glass, and such glass absorbs about 75 per cent of the light. At the Atlantic and Pacific entrances to the Canal, parts of which may be navigated without Canal pilots, red flashing lights will be tentatively used on the starboard hand, but in all other parts of the Canal white lights will be used until they are proved to be confusing.—*Shipping*, Illustrated.

GERMANY SUSPECTS OUR CANAL POLICY.—Although officially published by the German General Staff at the end of 1913, public attention has only just been drawn to some remarkable statements made by that supreme department of the Kaiser's army regarding "The Panama Canal as a military factor."

If the observations of the General Staff reflect the views of the German Government the latter undoubtedly suspects the United States of an intention of exploiting the Canal for active anti-European purposes.

After discussing the engineering aspects, past and present, of the canal, the article, which covers fourteen pages of the staff's quarterly publication, summarizes the "immediate consequences" of the opening of the Canal as follows:

First. Aggravated attempts on the part of the United States in the direction of supremacy on the American continent, at least as far as the Canal Zone, and perhaps to the Equator.

Second. A sharp competitive struggle against foreign, especially European commerce throughout Latin-America.

Third. A grave struggle between Japan and America for mastery in the Pacific.

Fourth. An increased endeavor to exclude the yellow race from American territory.

Fifth. The development of an American merchant marine.

Sixth. The gradual introduction of a vigorous, imperialistic policy on the part of the United States, accompanied by a strengthened army and navy.

The article is illustrated by two drawings by staff officers. It concludes:

"The Panama Canal was a bone of contention for generations before a spade of earth was turned. The Americans acquired it for battle. 'Battle' is the slogan over the Isthmian waterway. Like its past, its future will be presided over by the spirit of Mars."

To-night's official *North German Gazette* gives prominent space to an account of a debate between Colonel Roosevelt and Señor Zeballos at Buenos Aires. It is headlined: "Argentina's Rejection of the Monroe Doctrine."—*New York Times.*

PANAMA CANAL.—This work is now approaching completion, and it is expected that it will be possible to declare the Canal open for traffic in May next. The barrier against the ocean at the Pacific end of the Canal was blown up some time ago, 200 tons of dynamite being used for the purpose, and in a few hours the Canal was filled with water between the Gambia Dyke and the Miraflores Locks. In November a small steamer with some of the Canal officials on board passed through the Canal across the Isthmus of Panama by means of a cutting 45 feet deep through the Cucuracha slide, which is still delaying the completion of the Canal. To cope with this obstacle two large dredgers, costing £100,000, have been ordered. This Canal was commenced by the French engineers as far back as 1879. In 1902 it was taken over in an unfinished condition by the United States. The estimated cost was reckoned at £28,800,000. In 1906 this estimate was confirmed. It is now estimated that the total outlay will not be less than 70 millions of pounds. The Canal is 46 miles long and its highest water level 85 feet above the sea. There are six locks 1000 feet long by 110 feet wide. The width of the Canal varies from 300 feet to 500 feet and it is 41 feet deep. Over 40,000 men have been employed on the work. By means of this Canal it is claimed that in the voyage from New York to the ports on the north Pacific coast there will be a saving of 8415 miles, and to ports south of it 5000 miles. From Liverpool the corresponding reduction will be 6046 and 2600 miles.

In preparation of the expected additional traffic along the Pacific coast a sum, estimated as equal to that which has been expended on the Canal, is being expended between Alaska in the north to California in the south, by Americans and Canadians, in improving the ports on the coast and the railways connecting them with the interior. The commerce of these ports in the Pacific now amounts to 31 million tons of freight in a year, valued at 145 millions of pounds.

As regards the safety of the Canal from damage by earthquakes, it should be mentioned that during the recent disturbances in Central America the bed of the ocean off the coast of Panama is reported to have subsided at about 15 miles from the land 4000 feet, or from a depth of 1000 feet as shown on existing charts, to 5000 feet for about half a mile in width. The slip at Cucuracha has also developed a fresh movement, and has nearly closed the navigable channel of the Canal.—*Engineer.*

FACILITIES AT THE CANAL TERMINALS.—As the Panama Canal nears completion it is interesting to note that the government, with a view to attracting the greatest amount of shipping possible, has provided opportunity to purchase at reasonable and stated prices all supplies that vessels may need and ample dock accommodation. At either entrance models of modern port terminals will be found, while powerful dredges will be employed in keeping the channels unobstructed and of the uniform depth intended. Concrete piers 1000 feet long by 200 feet wide with slips 300 feet wide will be provided and standard gage railroad tracks will run alongside for the convenient handling of cargoes. At Balboa (Pacific side) there will be a length of 2200 feet of uncovered docks in front of the repair shops available in time of peace for commercial use. The main drydock at that terminal will have a usable length of 1000 feet, an entrance width of 110 and a depth of 35 feet. A smaller drydock will be 350 by 80 by 13½.

Floating cranes, high-powered harbor tugs, steel barges and a tender for passengers and mail will also be provided at either end. The channels of approach on the Atlantic side will be 500 feet wide and 41 feet deep; on the Pacific side 500 feet wide and 45 feet deep. The combined length of these approaches is 15½ miles, which makes about one-third of the Canal

proper at sea-level. A three-mile breakwater is constructed on the Pacific entrance to divert cross currents, and on the Atlantic side there is a west breakwater to protect against northers and an east breakwater to prevent silting in the Canal channel.—*The Marine Journal.*

The Panama Railroad Company holds a contract with the Republic of Colombia for ninety-nine years duration. This agreement was made in 1867 and under it the railroad holds lands, seaports, drydocks, warehouses and hotels required for all the necessities of its service.—*Marine Journal.*

The Panama Canal has reached such a condition of completion that a large ocean steamer could now pass through, according to a declaration made January 21 by Colonel Goethals. He says there is thirty feet depth of water through the Culebra Cut and Cucaracha slide, and it is his intention to send a Panama railroad steamer through the Canal, probably in April.

A circular order issued by Colonel Goethals January 21, to go into effect on February 1, abolishes the Atlantic and Pacific divisions of the canal construction because of the nearness of completion of the work. H. C. Cole, the engineer in charge of the Pacific division, will resign on that day. Lieut Colonel William L. Sibert, of the United States Corps of Engineers, the concrete construction engineer at Gatun Locks, also loses his engineering position, but retains his seat on the Panama Canal Commission.

Both ends of the Canal are practically completed, only the electrical installation and cleaning up remaining to be finished.

THE PANAMA-PACIFIC EXHIBITION.—Thirty-one nations have announced their intention to participate officially in the Panama-Pacific International Exhibition at San Francisco in 1915. It is interesting to remember that from Liverpool to San Francisco by the old route the distance was 13,731 nautical miles; across the Canal at Panama it is 8038 miles, a saving in distance of more than 5500 miles. The city, of course, has already important trade relations with Great Britain, and receives many millions of pounds worth of British products annually, which it redistributes to the surrounding country. British capital is heavily interested in the oil, timber, and mining industries of California and the development of the natural resources of the Pacific slopes of the American continent. It is believed that the opening of the Panama Canal will disclose new and larger markets for English manufacturers, and it is undoubted that many British manufacturers will be represented at the Panama-Pacific International Exhibition at San Francisco in 1915. Here they will come in contact not only with the markets of the west of the United States, but of those on the Pacific Coast of South America, which will be extensively represented at the exhibition. The comptroller of the exhibition, Mr. Rodney S. Durkee, says that sixteen million pounds will be expended.—*Engineering Weekly.*

FOR ANOTHER ISTHMIAN CANAL.—A seemingly well-posted correspondent of the *Army and Navy Journal* writes:

Recently articles have appeared in the public press intimating that foreign capital would be secured to construct another interoceanic canal from the Atlantic to the Pacific, through the territory of the Republic of Colombia, over the Atrato River route. This route was surveyed in the seventies by Commander, now Rear Admiral, Thomas O. Selfridge, U. S. Navy, and a brief synopsis of his report, at this time, may be of interest to your readers. The Atrato River is described as perhaps the fourth largest one in South America, rising in a spur of the Antioquian Mountains that connects them with the Cordilleras of Darien. After flowing generally north for several hundred miles, it empties by thirteen mouths into the Gulf of Darien, on the Atlantic side in the northwestern portion of the republic, about latitude eight degrees north. The harbor at the mouth of the river is described in the report as a magnificent one, and without a

superior, being ten miles in length and five miles in breadth, with a uniform depth of ten fathoms, being completely landlocked and easy of access. On the Pacific side the terminus of the proposed canal is on the bay of Chui-Chui, which lies open to the west and southwest, is clear of reefs and has good holding ground of clay, in about twenty fathoms, three-fourths of a miles from the beach.

The Atrato River, which is free from all obstructions except a bar at its mouth, is proposed to be used for canal purposes for 150 miles, and carries a depth of twenty-eight feet for that distance. The artificial cut or canal proper, to be excavated, is twenty-eight miles in length, of which twenty-two miles is over a plain, three miles of moderate deep cutting and three miles of tunneling.

The dimensions of the proposed canal are a depth of twenty-five feet, and width at bottom in earth of fifty feet and in rock of sixty feet, giving a working surface width of seventy-two feet, which is about the size of the Suez Canal. The tunnel proposed is to be 112 feet high, sixty feet wide, leaving eighty-seven feet in the clear above the water surface, and with two shafts sixteen feet in diameter; height of range, 660 feet. The water is to be drawn entirely from the Napipi River, a tributary of the Atrato which joins it near the point where the canal is to leave the Atrato. There are to be eight locks on the Atlantic side and twelve on the Pacific side with a lift of about ten feet each.

The report further states that there is no doubt that the Atrato is fully capable of ship navigaion from the Atlantic Ocean to the point where the canal is to leave it. From ocean to ocean, then, the only barriers are the half-mile sand bar at the mouth of the Atrato, and the twenty-eight miles intervening between that river and the Pacific, through which an artificial cut or canal must be made. The expense of construction is estimated at from $60,000,000 by the lock system described above to $90,000,000 without locks, with the exception of three at the western terminus. From this brief summary some idea may be formed of the difficulties and expense of utilizing this route for a canal.—*Nautical Gazette.*

EARTHQUAKES AND THE PANAMA CANAL.—Dr. Charles Davison, the leading English seismologist, discusses this subject in the *Geographical Journal*, and comes to conclusions almost as reassuring as those reached by Mr. D. F. MacDonald in his article in the *Scientific American* of October 18, 1913. He gives three reasons for thinking the danger from future shocks to be slight, viz., the fact that only three earthquakes, including that of last October, have attained even a semi-destructive character in the present Canal Zone since the time of the Spanish conquest; that, as pointed out by Mr. MacDonald, the Canal is remote from mountain ranges and does not traverse any important faults, so far as known; and, lastly, that even if a violent earthquake should occur it would probably have no more disastrous effect on the Canal than to cause landslides from the sides of the cuttings, as the researches of Milne, Sekiya and Omori have proved the destructive vibrations of earthquakes to be confined chiefly to the surface of the ground and to extend only in a slight degree to the bottom of a deep artificial excavation. All three arguments are, however, qualified; the first by the fact that violent quakes have sometimes occurred in regions previously exempt (*e. g.*, in the Colchester district of England, in 1884, and at Charleston, S. C., in 1886); the second by the fact that deep-seated faults, capable of giving rise to severe earthquakes, often exist in places where the surface conditions give no indication of their presence; and the third by the consideration that landslides caused by a violent earthquake, if they should occur after a prolonged period of heavy rain (a very probable event on the Isthmus), might themselves constitute a serious calamity.—*Scientific American.*

DISPOSITION OF CANAL MACHINERY.—A question which must often have occurred to engineers who have followed with any minuteness the con-

struction of the Panama Canal, and who have noted the enormous outlay which has been necessary upon machinery and equipment plant is, "What will become of all this costly equipment when the Canal is once completed?" A partial solution of the problem has now been afforded by the announcement that a large portion of the Canal machinery and equipment when finished with will be sent to Alaska for use in railway and dock construction and coal mining. The Isthmian Canal Commission has been asked to supply the United States Senate with information showing as nearly as possible the amount, character and value of construction machinery and material which will be available on the completion of the Panama Canal.—*The Engineer.*

MEASUREMENT RATES FOR THE CANAL.—By the rules of measurement that have been adopted for the Panama Canal, all vessels, excepting warships, will be required to present a certificate of their gross and net tonnages as determined by the rules. Warships will be required to present displacement tonnage at each possible mean draft. The measurement for the under-deck tonnage is the same as for the British and Suez Canal rules for vessels constructed with double bottoms having the inner bottom horizontal, but by the American rules the tonnage of double-bottom spaces intended for the carriage of oil fuel and feed water is added. The space for feed water is, however, deducted from the gross tonnage independently of the allowance for propelling power. The measurement rules, in fact, for the Panama have been based principally on those for the Suez Canal, only the Panama rules are somewhat more stringent.—*Marine Journal.*

RECOMMENDS PURCHASE OF CHESAPEAKE AND DELAWARE CANAL.—It is expected that the River and Harbor Bill which will be reported to the House very shortly will carry appropriations aggregating about $40,000,000, and it is stated that the War Department's report on this measure recommends the purchase of the Chesapeake and Delaware Canal at a cost not to exceed $2,514,290, with a view to enlarging it to a sea-level canal of about twelve feet depth and ninety feet in width. The whole estimated cost of this improvement is to be $8,000,000. Another interesting item that this bill will carry is $500,000 as an initial appropriation for improving the East River in conformity with the project urged by Mayor Mitchell. This will call for the removal of Coenties reef and Diamond shoal off the Battery and other obstructions dangerous to navigation in the East River.—*Marine Journal.*

THE KIEL CANAL.—It is expected that the enlarged waterway connecting the Baltic and North seas will be opened to navigation as early as April, 1914. The work of improvement, which has cost more than the building of the original canal in 1887, will enable the passage of the largest battleships. The German Emperor probably will accomplish this for the first time by personally commanding the main German battle fleet through the canal that bears his name (Kaiser Wilhelm).

The German canal will have locks 82 feet longer, 37½ feet broader and of 4 feet greater draft than those of Panama, and will accommodate a 60,000 ton battleship, should such a ship be built in the future. There is room and 200 feet to spare in them for the newest and biggest ocean liners, of the *Imperator* and *Aquitania* class, so that ample provision has been made for possible developments of commercial navigation as well.

The existing canal was opened in 1895. It runs from Kiel, on the Baltic, to Brunsbuttel, on the Elbe estuary, a short distance from the sea, and cuts off the long and rather hazardous passage through the Cattegat and around the northern end of Denmark. It jumped into importance immediately as a maritime highway and was used by about twenty thousand vessels during its first year. The traffic steadily grew, the canal being traversed in 1912 by 57,366 ships of 9,924,237 total net tons, a traffic larger than that of the Suez Canal.

To the German Navy it was of inestimable advantage, enabling the entire fleet to proceed from one sea to the other in a few hours. With the advent of dreadnoughts, however, this advantage was lost, as the old locks, 500 feet long, 83 feet wide and 30 feet deep, were too small to accommodate the latest ships, and it was determined to provide larger locks and double the width of the canal.

The new locks, which lack the imposing height of those at Panama but are bigger in every other respect, are 1082 feet long (Panama 1000 feet), 147½ feet wide (Panama 110 feet), and have a mean depth of 45 feet of water (Panama 41 feet) over the sills. The new canal is 400 feet wide at the surface, 150 feet wide at the bottom of the excavation and has been provided with eleven "sidings," at which vessels may moor. New harbors have been built at each end, several sharp curves have been eliminated, two new railway bridges 150 feet above the canal have been provided and other details have brought the cost of the improvement up to $55,600,000, whereas the original canal cost was only $39,218,000. The enlargement involved the excavation of 140,000,000 cubic yards of earth; the original canal, 112,000,000 cubic yards. The work, which occupied five years, was carried out without interrupting traffic in the canal.—*Shipping*, Illustrated.

THE LEIPZIG-BERLIN CANAL PROJECT.—In the last fifty years numerous projects have been formed for establishing a connection by water between Berlin and Leipzig. At a meeting of the Central Association for Inland Navigation, held at Berlin on January 21, a plan was brought forward which appears to have a prospect not only of state sanction but also of financial support. According to the preliminary investigations there are no insuperable technical difficulties, and the cost would amount to little over £3,000,000. The new waterway would proceed from Leipzig to Eilenburg on the Mulde, and thence to the river Elbe at Torgau. It would then follow the Elbe downstream for twenty-seven miles as far as its junction with the Elster. The canal would then leave the Elbe and proceed northwards *via* Luckenwalde and Trebbin to the river Havel at Potsdam. The importance of this waterway would be very considerable, especially in conjunction with the ship canal from Berlin to Stettin, which is on the point of completion. By this means Leipzig and other important commercial centers in the vicinity would obtain a connection by water, not only with Berlin, but also with Hamburg and Stettin in the north, and with Dresden and the Bohemian towns in the south.—*Engineer*.

SUEZ CANAL.—The last report issued shows a continued increase in traffic, 5373 vessels having a net tonnage of 20¼ millions passed through the canal, an increase of 304 vessels and 1811 million tons. The average net tonnage of vessels passing through has risen from 3692 to 3763. The receipts, in spite of the reduction of 5d. per ton in the dues, show an increase of £68,400 above the preceding year. This increase is principally due to the trade of India, Japan, China, the Dutch East Indies, and Australia.—*Engineer*.

The Suez Canal was constructed and has been enlarged and managed by a private corporation, which has invested from the beginning about $127,000,000, two-thirds of which has been secured by the sale of securities and the remaining one-third taken from earnings. The original capital of the Suez Canal Co., issued in 1859, was 400,000 shares of 500 francs each.

In 1875 the British Government purchased 176,602 shares held by the Khedive of Egypt, for £4,000,000. The British Government does not own a majority of the shares and the canal is controlled and operated by a French company.

The earnings and profits of the company are large.

Statutory Division of Profits

		Francs
71%	to stockholders	61,823,600.00
15%	to Egyptian Government	13,061,323.94
10%	to founders of company	8,707,549.29
2%	to administrative officers	1,741,509.86
2%	to employees	1,741,509.86
Total		87,075,492.95

—Taken from report by E. R. Johnson.

THE GEORGIAN BAY SHIP CANAL.—A paper dealing with the proposed Georgian Bay Ship Canal project was presented before the Colonial Section of the Royal Society of Arts by Sir Robert W. Perks. The canal is intended to start from Georgian Bay, on Lake Huron, and, taking advantage of several rivers and small lakes, to cut straight across the peninsula past Ottawa and Montreal and end in the St. Lawrence, in the neighborhood of the latter city. By employing it the water-borne trade originating on the shores of Lakes Superior, Michigan, and Huron would have a direct passage to the St. Lawrence without having to use Lake Erie, the Erie Canal, and Lake Champlain. According to Sir Robert Perks, the trade flowing eastwards represents at present 72 million tons a year—twice that passing through the Suez Canal—and is doubling itself every six years. The total includes 35 million bushels of wheat, but at present 80 per cent of this grain is diverted at Buffalo and elsewhere, and carried over American railways to Boston, Portland, and New York for shipment to Europe. With the canal in use all this trade could be carried from the shores of the Great Lakes, without transhipment, to its transatlantic destination and without leaving British territory.

The proposed canal would have a total length of 449 miles, and would, it is estimated, cost between 24 and 30 million pounds. This cost is low in comparison with that of the Suez Canal—100 miles and 22 millions—and that of the Panama Canal—46 miles and 80 millions. This is explained by the fact that of the total distance 332 miles would be provided by natural waterways 300 feet wide and over 22 feet deep. The heavy work, such as locks and cuttings, would amount only to some 30 miles.

MISCELLANEOUS

MEXICO.—The population of Mexico is 15,000,000, divided as follows: Full-blood Indians, 8,000,000; Mesitzos (white and Indian), 4,000,000; Creoles (whites of Spanish descent), 1,800,000. The rest of the 15,000,000 is made up of Europeans and Americans (200,000), and "Zambos," mulattoes and negroes.—*Marine Journal.*

GUNNERS AND GROG.—*Is Naval Shooting Affected by Week-End Excesses?* The question whether alcohol affects men's eyes has been submitted to the medical director of an institution which endeavors to cure alcoholism.

It arose from a statement that experiments made by the *Natal* had shown that the men's shooting was lowest on Mondays, when they came back from their week-end leave, and that it gradually improved until Fridays.

The doctor pointed out that the men experimented on by the commander of the *Natal* were not alcoholics in the ordinary sense of the word, but thoroughly temperate English seamen, who, perhaps, went on the "spree" occasionally, but would certainly not do so once a week. In their case an overdose of alcohol might, probably, make them bilious, and that would certainly affect their eyes. The tendency would be towards diplopia; that is to say, the power of co-ordinating the work of the two eyes would be

lost, and they would be apt to "see double." Probably the very fact that sailors were such temperate men when at work made their eyes so very sensitive to occasional overdoses.

Alcohol and the Eyes.—The eyes of the habitual toper suffered, he said, in quite a different way. Constant doses of alcohol acted directly on the central nervous system and caused what were known as exaggerated reflexes. One of these was the response of the iris to changes of light. A healthy man had a tiny pupil in bright light and a large one in the dark but the eye of a neurotic responded so quickly to the effect of light that it usually overshot the right adaptation. Still this seldom led to large errors in refraction.

The greatest effects of alcohol on good shooting would not be on the eye itself, but on the connection between the eye and the other organs of sense, and even between the eye and the movements of the bodily muscles. The eye following the telescopic sights of a gun might be capable of setting the gun perfectly, but as the object to be fired at was only over the sights for a fraction of a second, the power of firing the gun at the moment that the eye said that the projectile should start was of paramount importance. Alcohol would probably prevent this. It would be neither the eye nor the movements nor the powers of signalling that would be out of order, but the necessary working together.—*Naval and Military Record.*

PEACE HATH ITS VICTORIES.—The ratification of eight arbitration treaties and the rejection by a heavy vote of an amendment withdrawing the Panama tolls from their scope is a notable victory for the cause of peace and for the observance of national good faith which is a prime condition of the maintenance of peace.

It is especially notable that the text of these treaties—the same for all—renews the pledge of the United States to refer differences "which it may not have been possible to settle by diplomacy" "to the Permanent Court of Arbitration established at The Hague by the convention of July 29, 1899." It is true that there are reserved questions affecting the "vital interests, the independence, or the honor of the two contracting states," but experience has shown that in reality such questions can be and have been arbitrated with entire success. The most conspicuous case was that of the Alabama, as to which Earl Russell, for the British Government, began by absolute refusal to arbitrate on the ground that British honor was deeply involved, and ended by assenting to a settlement that has proved of incalculable value to both countries. Under the terms of the renewed treaties the responsibility will be well defined in each successive case for a decision that any given question shall be excluded. It is a responsibility which no government, our own or other, will venture to ignore or to treat lightly. And every case that shall go to the Permanent Tribunal hastens the time when there shall be adjudication, not arbitration only, of international differences.

Perhaps the vote on the withdrawal of the tolls question from arbitration is not conclusive as to the final repeal of the exemption provision, but it is clearly very encouraging. There is practically but one opinion as to what would happen to tolls exemption if it ever went to arbitration. Indeed, the friends of the measure have rather loudly insisted that it should not be arbitrated. It was they who proposed to except it from the treaties. They were defeated by more than a two-thirds vote. It does not surely follow that a majority can be got for repeal, but the movement for repeal is obviously strengthened.

President Wilson is entitled to hearty congratulations and much praise for his conduct of this phase of international policy. He has distinctly and fearlessly stood for the maintenance of the national honor which binds us to be honorable, and he has firmly refused his assent to any evasion of fair obligations. He has done this under conditions that were disheartening. He has won the advance that he has so far made by appeals to the conscience and the good sense of Senators and Congressmen, and by like

appeal, judicious and dignified but frank and open, to the people. If he wins completely, as we are confident that he will, having in mind particularly the tolls question and that of Colombia, he will not only have maintained the honor of the nation, he will have advanced it and placed it on firmer foundations. It is a great and noble service.—*New York Times.*

FOR THE THIRD TIME.—Secretary of State Root was of the opinion that the greatest gain from the second Hague conference was the provision it made for calling a third and the reasonable hope it gave that successive conferences would be held at fairly regular intervals. The provision made was not so definite and effectual as it might have been, and there has been some unfortunate delay in carrying it out. But the requisite steps have finally been taken by our government. Whether they will lead to a conference next year, or the year after, will depend in great degree upon the strength of public sentiment in various countries, and especially in our own.

To arouse this sentiment, to direct it, and give organized expression to it, a citizens' national committee has been formed, which will work with like organizations in other hands. It would be hard to find in the United States a group of more eminent citizens or one enjoying in higher degree the confidence and respect of the public. Mr. Andrew D. White, Mr. Choate, General Porter, Mr. Straus, ex-Secretary Foster, Mr. Low, Admiral Mahan, President Butler, these are all men of international reputation, while the remainder of the committee are of well-known ability and character, whose influence will be valuable.

In his letter to the committee Mr. White called particular attention to the need of international regulation of aerial ships in time of war. It is undoubtedly a grave subject, and the military powers are at present deeply engaged in developing airships as instruments of destruction, and paying little heed to the limitation of their use. It is almost unthinkable that limitations will not ultimately be agreed upon. For that purpose the general conference at The Hague should be rendered certain. It is not only the best but practically the only effective agency for dealing with a matter of such importance.

The greatest utility of the conference, however, is in its gradual promotion of international adjudication of differences. Two facts are of significance in connection with this function. One is that the second conference adopted the principle of international adjudication and took the first steps toward organizing a court to apply it. The other is that the second conference, in its action as to an international prize court with jurisdiction as to captures at sea, actually applied the principle to an important field of international relations, and a very difficult field, in which powerful interests and deeply rooted prejudices were stiffly opposed to the change. Here was a distinct departure from the time-honored maxim that in war the voice of law is hushed, a distinct advance from the old idea that, once war begins, force, and force alone, must determine the issue. It is of the utmost importance that the beginning thus made shall be carried forward. The Hague conferences have acted, in a tentative and somewhat hesitant fashion, but with a degree of real efficiency, as an international legislature. This action points toward the evolution of an international judiciary, and ultimately toward means corresponding to an international executive, in other words toward the reign of law, order, justice, and peace which prevails within the borders of each civilized nation. The path to this end will be difficult, thorny, often obscure, but entrance upon it may be said to have been made, and the next forward movement must be through a third conference.—*New York Times.*

MILITARY KNOWLEDGE AND NATIONAL DEFENCE.—In an article published in the British *Army and Navy Gazette*, Lieut. Colonel Alsager Pollock sets forth the proposition that higher instruction of university undergraduates in the science of war—in the fields of history and strategy—can scarcely fail to prove highly beneficial in a national as well as in a strictly military sense.

Colonel Pollock in developing this proposition points out that the members of the "Conference" held at the London University readily appreciated this dual advantage to be obtained by the scheme of a general system of military schools. He states that: Those who pass from university life, having taken a degree with honors in the military school, thereafter obtaining commissions in the Territorial Force, must necessarily be more competent officers (capable in some cases, as Colonel King pointed out, of undertaking staff duties) than if their military education had been elementary only; but far more important than this will be the large infusion of sound thought into public life. Ignorance of all things appertaining to national defence is now, as it has ever been, a curse of the House of Commons, in a measure as great as knowledge would be a blessing. Members of the House of Commons are, as a rule, university men, and the military school having once been given a place in the universities' curriculum, on a par with, say, chemistry and divinity, it seems reasonable to anticipate that many would seek their degrees through the military school, although having no intention whatever of serving as officers of the Territorial Force.

Alison remarks (Chapter XIII., 129): "Young men too often enter the Houses of Lords and Commons perfectly initiated in the loves of Dido and Æneas, of Mars and Venus; able to construe Æschylus and write hexameter verses; perhaps skilled in forensic debate and happy in Parliamentary allusions; but as ignorant of the means by which success is to be attained, or disaster averted, in war as the child unborn." The limited vision, the hopeless wanting in sense of proportion, that marks the speeches delivered by average members of Parliament, on the rare occasions when thought is given to National Defence in preference to the parish pump, are explainable—though not excusable—on the score of colossal ignorance only. By military education at our universities, this lamentable situation could not fail to be considerably ameliorated. Almost without exception the men most greatly distinguished in the public life of the United States are graduates of West Point; I speak not of persons who have merely rendered themselves notorious as cunning charlatans, but of those who have honestly achieved distinction as wise statesmen, patriotic citizens and straight-forward as well as successful men of business. The lesson for us seems obvious. Let us go forward and do likewise, so that in our Parliament knowledge may indeed be power and ignorance a reproach.—*Army and Navy Gazette.*

A SCHOOL OF NAVAL ARCHITECTURE.—One of the great groups of buildings which the Massachusetts Institute of Technology is about to erect in Cambridge, Mass., on the banks of Charles River, will be the home of the Pratt School of Naval Architecture and Marine Engineering recently endowed by the late C. H. Pratt, of Boston. In his will, which has been the subject of legal controversy in which technology won, Mr. Pratt made the condition that when his bequest had reached the sum of $750,000, part of it was to be used for the erection of a suitable building for the school, and part for its maintenance. In about two years, it is expected, the condition of amount will be met.

The new building will have the place of honor on the Massachusetts front of the group. The main feature is to be the towing tank, which will occupy the basement. Technology has now two floating laboratories, the *Froude* and the *Fulton*, which in the Charles River basin have solved a number of practical problems, but the indoor tank is more available for certain other lines of work. The tank will possess all the features that experience with the Washington tank has shown to be valuable.

Prof. Cecil H. Peabody is the director of the school. How prominent it is may be seen from the sending by a Clyde firm of shipbuilders of the son of a partner to technology for this special training, and the recent declaration of a German student in it, that he came to the institute because there is no school comparable to it in his own country.—*Nautical Gazette.*

BOY SCOUTS: EXCERPTS FROM SIR R. BADEN-POWELL'S LETTER.—From top to bottom of our social structure—from the rich man to whom golf or motoring is everything down to the loafer whose leisure is spent in worse ways than merely watching hireling footballers—there are too many drones in our hive, and the result is misery and discontent, selfishness, thriftlessness, and irreligion.

In the boy scouts we seek to eliminate the drone and to provide that the next generation shall be a generation of workers, of men who do things, not leaving them to others to do—above all, men who will think of others, as well as of themselves. We try to "educate" the boys by drawing out the best that is in them, rather than to "instruct" them by drilling knowledge into them, and our methods of training character are such as appeal to the boys themselves; they learn voluntarily and eagerly, and not by compulsion.

The sea scouts are developing rapidly, and their value to a nation, dependent as we are alike upon our navy and our mercantile marine, can hardly be over-estimated. In this branch of our work we are at once providing careers for many who might otherwise have drifted into casual labor and supplying a reservoir from which the country may in time to come draw her best sailors. It is notable that many captains have already expressed their preference for sea scouts.

Lastly, our desire to provide the boys with careers as well as character has led us to establish a farm on scout principles, where they may acquire knowledge of a practical kind, which will be of the utmost service to them, whether they remain at home or settle in one of the over-seas dominions. This department of work also has great possibilities, and we are eager to extend it.

These are our needs, and we appeal for an exceptional effort on the part of our friends which will enable us to meet them year by year without further calling upon their generosity.

We claim as the justification for that appeal that we are making good citizens out of what would in many cases have been mere waste material, and our nation in this age of increasing competition with others who are numerically stronger cannot afford to waste a single man; that scouting is recognized by employers as increasing the actual cash value of their boys to them, and by educationists as a really practical form of education; that we are gradually eradicating class feeling and strengthening the bonds that unite nations. In a word, we are helping to make the world of the next generation a better world than it is to-day.—*Army and Navy Gazette.*

NEW BRITISH SHIPYARD ON THE PACIFIC.—During the month the news came to hand that Mr. A. F. Yarrow had acquired the works of an existing shipbuilding and repairing company, which is situated on the shores of Esquimalt Bay, Vancouver. It had been known that Mr. Yarrow had for the last few months been examining various places on the Pacific Coast of North America with a view to acquiring a site for a shipyard, the founding of which he has for some time had in mind. His intention is, we believe, to carry out such shipbuilding and repairing work as may be offered, and at the same time to be ready to build torpedo-boat destroyers and similar vessels for the Canadian Government. It is a bold venture, but Mr. Yarrow is accustomed to venture boldly, and we have very little doubt that the undertaking will prosper, in spite of the restrictive tariff which is now imposed on shipbuilding material imported into Canada. In the first place, Mr. Yarrow has acquired a going and thriving concern, and the amount of repair and building work which is likely to come his way should certainly be sufficient to prove remunerative, since the shipyard is the first to be met with on the northern Pacific coast. Then, again, a very large dry-dock is to be built by the government close by the works. Moreover, such an astute man as Mr. Yarrow is not likely to have embarked in such an undertaking without very considerable probability of the Canadian Government requiring high-speed war vessels of the type for which his firm has

gained such a remarkable reputation. It may well be that either the existing tariff on shipbuilding material will be removed or reduced, or that, as an alternative, government bounties will be instituted.—*Engineer.*

The Lake Submarine Co., of Bridgeport, Conn., which was in financial difficulties, has reorganized under the laws of Maine as the Lake Torpedo Boat Co. The new directors chosen at a meeting in Augusta elected F. B. Whitney, of Washington, D. C., president; Henry J. Miller, Elizabeth, N. J., vice-president; Simon Lake, Milford, Conn., treasurer; Frank Miller, Bridgeport, secretary, and C. E. Adams, Bridgeport, assistant treasurer. The company has a contract with Simon Lake as a consulting engineer, and also has available as general manager the services of R. H. M. Robinson, late U. S. Navy, as well as Philip B. Brill and R. E. Anderson naval architects. The company has contracts for three submarines of the *L* type and has notified Secretary Daniels that it now has means to resume work.—*Shipping,* Illustrated.

JAPAN DISSATISFIED.—Japan regards as not at all satisfactory the replies made by the United States to her protests in connection with the Californian alien land-ownership legislation according to a statement made January 21 by Baron Nobuaki Makino, the Japanese Foreign Minister, in the course of a summary of the Japanese-American negotiations given in his annual address to Parliament. He said:

"Japan recognizes the necessity of elaborating other plans for the solution of the question. The nature of these plans I am as yet unable to report."

Baron Makino's declaration that "no answer whatever" had been made by the United States to Japan's third protest presented in August, was the signal for an attack upon the government by several members of the Opposition, who alleged that too much reliance had been placed upon the good will of America.

The address by Baron Makino, the Japanese Foreign Minister, delivered before the Parliament of Japan January 21, outlining the status of negotiations over the California alien land legislation, and declaring that the Japanese Government had "come to see the necessity of considering some other way for a solution of the question," because the replies of the United States had not been found satisfactory, was cabled in full from Tokio to the Japanese Embassy here.

The address revealed the fact that the Ambassador, under instructions from Tokio, saw President Wilson on March 5, the day after the president's inauguration, and asked that he make an effort to stop the threatened legislation in California, which has since been enacted.

After reciting the history of the Japanese attempts to head off the threatened legislation and of Secretary Bryan's visit to California before the alien land bill was passed, the address proceeds:

"Upon receipt of the information that the bill had become law, the Secretary of State handed to Viscount Chinda a reply to the protest of the Imperial Government. The reply began by recording the fact that efforts had been made to the fullest extent by the United States Government to prevent the legislation, expressing regret as to its final enactment, then went on to state emphatically that the enactment was purely the outcome of economic questions, and further gave counter arguments on various points raised in our protest. But as the reply was not satisfactory to the Imperial Government, the Ambassador was instructed to address on June 4 a second communication to the Secretary of State in answer to the reply discussing in detail the point concerning the violation of the treaty. On June 16 the Secretary of State handed to Viscount Chinda the rejoinder in which counter arguments on various points mentioned in the second communication of the Imperial Government were given fully and in detail, and some suggestions were mentioned as to the remedial measures concerning the legislation.

"The Imperial Government then prepared the third note of protest and caused the Ambassador to present it on August 18 to the Secretary of State, which note remains unanswered.

"While the protests of the Imperial Government and the replies of the United States Government relative to the land act of California are, as have been outlined, the details of which the Imperial Government regrets to be unable to publish, the replies of the United States Government were not found satisfactory, and the Imperial Government has come to see the necessity of considering some other ways for the solution of the question. However, to the regret of the government, the time has not arrived for reporting on the point."—*New York Times.*

FLOOR OF THE ATLANTIC.—*Topography of the Bottom of the Great Ocean.*—If all the hills on the earth were used to fill in all the valleys, we should have a world as smooth as a billiard ball, completely covered with an ocean 8700 feet deep. That depth is called the "mean sphere level." The Atlantic Ocean has an average depth that differs little from that level, for, compared with the other great oceans, it has an unusually large area of comparatively shallow water.

First comes the shelf-like "continental slope"; then follows, at a much lower level, a vast plain of a uniform, dull grayish-buff color, flat and featureless as the desert, unmarked except by an occasional rock or wreck, or recently laid cable. This plain continues with hardly a break until it reaches the great mid-Atlantic ridge that extends from Iceland as far south as 53 degrees south latitude, and that roughly bisects the ocean. The ridge runs almost parallel with the eastern contour of North and South America—a contour that, in turn, corresponds roughly with the western contour of Europe and Africa. Occasionally the ridge rises above the surface. The Azores, St. Paul's Rocks, Ascension Island, the Island of Tristan da Cunha and the Gough Islands are all part of it.—*Marine Journal.*

ARMY MEN GOING ABROAD.—*Junior Officers to have Tours of Service with Foreign Armies.*—The colonels commanding the various infantry, cavalry, and field artillery regiments of the army have been asked by the War Department to recommend the two best qualified of the junior officers of each regiment for a tour of service in the German and French armies. The tours of duty are for one year, and the first assignments, it is understood, will be those of the officers who are decided to be the best fitted for the year's instruction in the Kaiser's Army. Those who will be sent to France will be designated immediately following the selection of the officers who go to Germany.

There are thirty regiments of infantry, fifteen of cavalry, and six of field artillery, which means that when the recommendations of the regimental commanders are all in the War Department will have a list of 102 young officers to select from. At first five officers will be sent to the German and three to the French Army. Four infantry officers will be sent to Germany for service with German infantry regiments and one cavalry officer for duty with one of the crack German horse commands. Two field artillery officers and one infantry officer will be designated for service with French regiments of those arms.

In addition to these officers the quartermaster general of the army has been asked to recommend an officer to attend the British Army Supply School, the course to commence next June. The quartermaster general will also recommend an officer from the quartermaster corps to attend the French School of Intendance.—*New York Times.*

POLAR EXPEDITION.—All service men will follow the progress of Sir Ernest Shackleton's new Polar Expedition with the keenest interest, and with the sincere hope that it will accomplish all that its distinguished leader has planned for it. That is admittedly no small task. "The Imperial Trans-Antarctic Expedition," as its name implies, will differ from all

previous Polar undertakings in the comprehensiveness of its scope. Leaving Buenos Aires next October, it will endeavor between then and the spring of 1916 to cross the entire Antarctic Continent from the Weddell Sea to the Ross Sea, passing the South Pole *en route*. The journey from sea to sea will be about 1700 statute miles. If the transcontinental party are successful in completing this journey in one season—and Sir Ernest has said that with favorable conditions it may be done in five months—news of their success should be received in the spring of 1915, but the expedition will be equipped for two years work in the Antarctic. As the *Times* says, it is the ambition of Sir Ernest Shackleton to re-establish the prestige of Great Britain in the work of Polar exploration. Until 1909, the British Empire led the world in this field of discovery, but since then Peary has penetrated to the North and Amundsen to the South Poles. But it is not merely to gratify national pride that the new expedition is being organized; while it will most certainly do that, its main purpose is to traverse ground never before trodden by human foot and thereby to open up secrets to geographers, biologists, scientists, and meteorological experts, and generally to add to the sum total of human knowledge. Among the forty-two members of the expedition there are certain to be some connected with the fighting services, especially the navy, for Sir Ernest, himself an old naval reserve officer, knows better than anyone else the value of men who have been used to service discipline and training on such arduous and trying work as that in the Polar regions. In his endeavor to carry on the work for which the gallant Captain Scott gave his life, Sir Ernest Shackleton deserves well of the nation and the empire.—*Army and Navy Gazette.*

THE KING OF ALBANIA.—It is not without a touch of significance that the name of the little mediatized principality of Wied, from which the new King of Albania takes his title, is the peasant's word for a band with which fagots are bound. It suggests the task which the prince has undertaken. The elements in his kingdom which he will have to bring and hold together are many and various, and some of them savagely hostile, and the means at his command are limited and uncertain.

Nominally he is the representative of the concert of the great powers. In reality the powers were practically coerced by Austria and Italy to exclude Albania from division or possession by the Balkan allies. Austria was resolved that she would fight rather than see Servia secure access to the Adriatic seaboard, or Montenegro secure possession of Scutari, Italy, which has its own ambitions in the region, was equally resolved that Austria should not establish any claim conflicting with her own. So Prince William starts out with a kingdom which two powers are content to set up until they get ready to contend for their respective interests. His first need will be to steer a course that shall keep these rivals from open conflict.

His next will be to keep peace and order in Albania, which is a very cockpit of race and family feuds. The Ghegs in the northern part of the country and the Tosks in the southern part are in a general way bitterly hostile to each other, and though they have both supplied troops to Turkey who have fought well side by side, there is always trouble along the border of the regions occupied by them. Within each of the two races there is an indefinite number of tribes and families, between which the vendetta is handed down from generation to generation. Of anything like a central government there is hardly a trace, nor are there organized district governments capable or desirous of maintaining order. The country is almost wholly without railways or even wagon roads, and the chief mode of communication is by bridle paths or foot trails. Owing to the savage temper of most of the Albanians, and the existence of feuds among them, considerable parts of Albania have never been even explored, and are nearly as unknown to outsiders as the depths of Central Africa.

In our wireless dispatches it is stated that Prince William will embark for his new kingdom in the course of the next month. His first business will be to test the good faith of Essad Pasha, who is reported to have an

army of some 15,000 and whose professed allegiance is open to some suspicion. If Essad proves faithful, the next task will be the organization of a corps of effective gendarmerie to keep the Albanians from each others' throats and from the throats of their neighbors. It is in the creation of such a force and in its employment that the function of fagot-band will have to be performed. It will be a tough undertaking. The population of Albania is estimated—there has never been anything like a census—at 1,600,000, about one-fourth of whom are Serbs, Bulgarians, and Greeks. For the most part the Albanians are wholly averse to paying taxes of any sort, and are much addicted to fighting. But though the job is a hard one, it may, with tact and energy and firmness, be found practicable. It is hardly more formidable than Austria performed with notable success in Bosnia.—*New York Times.*

THE TOLL OF THE SEA.—In spite of better construction, more accurate charts and the continued improvement of lighthouse service, the sea continues to take an enormous annual toll in property and lives of those that traverse its surface. The marine disasters of 1913 amounted in money value to $35,000,000 in British-insured ships and cargoes that were totally lost. On the Great Lakes alone, the storm of last November rolled up a loss of $4,700,000. The above figures do not include damages to ships and cargoes that were not total losses; for these, the damages amount to over $30,000,000.—*Scientific American.*

"NEW LAMPS FOR OLD."—This week an effective illustration will be furnished of the only method by which a navy can be maintained in efficiency—namely, by scrapping old ships and using the highly trained officers and men for manning new vessels. On Tuesday the old battleship *Royal Oak,* one of the ships laid down under the Naval and Defence Act of 1889, was offered for sale at Sheerness dockyard, and to-morrow the *Royal Oak* and her sister, the *Royal Sovereign,* will be laid down at Devonport and Portsmouth dockyards respectively. The orders for the other three ships of the program were given to private firms in November last, and consequently by the end of this week all the five vessels will be under construction, and in the early days of the new session Parliament will have to face a supplementary estimate providing for about five months work on the contract-built ships. There has been no indication that the Admiralty have decided to spread the construction of the *Royal Sovereigns* over a longer period than two years, and in that event the fleet should be strengthened by all the five units by the end of January, 1916. It is not necessary to be a cynic, however, to indulge in the anticipation that the five ships will not, as a matter of fact, be in commission two years hence. Indeed, labor troubles and other considerations point to the period of construction being considerably longer than this, and no surprise will be felt if naval shipbuilding in the near future falls even more seriously into arrears than it has done during the year which has now closed.—*Naval and Military Record,* January 14, 1914.

MARTIAL LAW IN SOUTH AFRICA.—A decidedly difficult situation has been created by the recent action of the Union Government of South Africa in connection with the proclamation of martial law and the subsequent deportation of certain labor leaders, but it will be impossible to pronounce a final opinion upon it until the Act of Indemnity comes before the Imperial Government for ratification. That the proceedings will be challenged vigorously there is little doubt, as the circumstances must be very grave to justify the use of these methods. It has always been the assumption that war or rebellion must be the basis of necessity for martial law, or as other authorities define it, "war, insurrection, or riot." The point to be decided, therefore, is whether the disturbance or riot was, in this case, sufficiently serious or extensive to warrant the intervention of military force and the proclamation of martial law. Lord Gladstone referred briefly to the ques-

tion in opening the Union Parliament, dealing with the nature and extent of the unrest which preceded the strikes all over the country, and declared that the safety and well-being of the whole Union made the declaration of martial law imperative. The full and detailed explanation of the government's action was made later by the Minister of Defence, General Smuts, who labored to show that the movement against which these drastic measures were taken was, from start to finish, no ordinary strike, but a dangerous Syndicalist conspiracy, and certainly some of the evidence he produced was of a most damaging character to the cause of the now deported leaders. He stated that their object was to starve the country into submission to their demands, and that they aimed at revoluion and civil war. General Smuts' speech made a great impression, but at the time of writing the decision of the Assembly is still in doubt. It has to be borne in mind, however, that General Smuts' account of the circumstances which led up to the climax is the government version, and that the other side has yet to be heard. So far the evidence as to the alleged existence of a revolutionary conspiracy with a military organization is not very convincing.—*United Service Gazette.*

UNWRITTEN LAW OF THE SEA.—There is another of these unwritten laws which we think could be repealed to advantage. It is that which requires the captain of a ship to stay on the bridge during fog or very bad weather, no matter how long it continues. It is a fairly common thing to read in dispatches that the captain of this or that ship had been on the bridge for twenty-four or forty-eight or even sixty hours at a stretch because of storm or fog. Why should this be the practice? The most rugged man alive cannot be as alert, mentally and physically, after twenty-four hours of exposure as he was when he went on duty. He cannot be as competent to render quick decisions—such, for instance, as an impending collision might call for—as a man who was unfatigued. The average transatlantic passenger, we fancy, would much prefer to trust his life in an emergency to a fresh chief officer than to a jaded captain.—*Marine Journal.*

NATIONAL RIFLE BOARD.—The National Rifle Board has decided on a radical change in holding the annual competition. Instead of one great meet at Camp Perry, Ohio, for all teams from the army, navy, marine corps, the national guard, and foreign rifle organizations, there are to be divisional meets held in various parts of the country. It is believed that a larger number of competitors can be accommodated in this way, and there will be less expense and greater interest. The new plan will not go into effect until 1916, and the meet this year and next will be held at one central place.

The board consists of Henry Breckinridge, assistant secretary of war, president; Lieut. Comdr. Thomas T. Craven, U. S. Navy; Capt. S. J. Bayard Schinde, U. S. Army; Capt. William G. Fay, U. S. Marine Corps; Brig. Gen. Charles D. Gaither, Maryland; Brig. Gen. Bird W. Spencer, New Jersey; Brig. Gen. James A. Drain, Washington; Maj. Gen. Clifford R. Foster, Florida, and Lieut. Col. S. W. Brookhart, Iowa.

It declared in favor of the establishment of one large rifle range in each state for the army and the navy and the marine corps, the national guard, civilians, and school and college students. These ranges are to be suited to all classes of firing, including combat fire and skirmish and battle marksmanship.

Another important action by the board was the adoption of a rule which admits teams from all military schools and colleges in the country to the annual competition. Provision was made for the issuance of a silver placque to the national guard organization in each state which proved in competition to be the most proficient. The rules for the next competition will be those of the new army target practice regulations prepared by Major Henry G. Learnard, the 14th infantry, which are now being issued and will soon be in the hands of the army, the navy, the marine corps, and the national guard.

The board discussed the boundaries of the proposed divisions for target practice and competitions, but no conclusions were reached. One competition will probably be held in Florida on the state range, one at Sea Girt, N. J.; one at Wakefield, Mass.; another at Camp Perry, and others at places yet to be chosen. A request was made of the Secretary of War to distribute the subtarget machines now on hand to high schools in large cities to stimulate interest in target practice.

The competitions in pistol practice and in the range meets will no longer be with the ordinary revolver, but with the new automatics which are being furnished to the army. The caliber of this weapon is .45, and work with it is regarded as more severe than with the old revolver, but there is a great gain in effectiveness as proficiency increases.—*Army and Navy Register.*

LARGE FIELD OF EMPLOYMENT.—Nothing is more extraordinary than the failure of the reductionists to realize what a large field of employment the navy provides. Four years ago it was officially stated by the Admiralty that approximately seventy per cent of the total cost of a dreadnought goes in paying for labor; consequently, if each of the five battleships of this year's program costs £2,750,000, skilled laborers of many trades will as a result receive payment amounting to over £9,500,000. But the armored ships constitute only one part of the program. Including cruisers and torpedo craft, the program of the present year represents an aggregate expenditure of just under £16,000,000, and of this large sum £11,000,000 will go in the payment of wages. Even this calculation, however, does not take into account the sum devoted to repairs. The total amount set aside for shipbuilding and repairing is over £22,000,000, and out of this sum skilled artizans will receive nearly £15,500,000. *The Daily Express,* which has directed attention to this aspect of naval activity, points out that this distribution of money is equal to just under £300,000 every week, or, in other words, provides constant employment for twelve months for about 150,000 men at £2 a week. The assumption that this money is all spent in the shipbuilding districts or the dockyard towns is a misapprehension. There is hardly a district of England devoted to any kind of manufacture which does not profit by the contracts issued from time to time by the Admiralty. A ship of war is very like a house, and scores of various kinds of articles are required. Indeed, the larger proportion of the sum voted by the navy goes directly or indirectly into the pockets of the wage-earning classes. The pay and victualling and clothing of the service absorbs over £11,000,000 and the £3,500,000 spent upon works also represents payments made to those who are engaged in the building trade.—*Naval and Military Record.*

GERMAN ARMY INSTRUCTOR FOR PARAGUAY.—A recent German Imperial Order has decided to send 8 German instructors (3 captains and 5 lieutenants) to reorganize the army of Paraguay. The negotiations on behalf of the South American state were carried out in Berlin by the German Consul-General of Paraguay, and it is anticipated that this military mission will create new industrial and commercial openings for German products.—*United Service Magazine.*

PITCHINGLESS AND WAVELESS SHIPS.—At the meeting of the Japanese Institution of Naval Architects held last November, Dr. Y. Yokota read a paper on "A Rollingless, Pitchingless and Waveless Ship." This paper gave a bold conception of a ship of the future, designed to have minimum resistance, and, at the same time, natural immunity from those movements which at present are most distressing to the traveller and detrimental to utility. For unlimited reduction of wave-making resistance he based his work on Lord Kelvin's investigations into "Deep-Water Ship Waves" (Mathematical and Physical Papers, Vol. IV, pages 368-390), and evolved a waveless ship. Proceeding, he superimposed several such shapes, suit-

able for the speed he required; and, further, considered the other qualities that his investigation aimed at. Increase of breadth was one of the steps in the process; but the increase was so marked that it seems best to wait until Dr. Yokota has had time to make a few promised experiments that will justify his general position and give confidence that the revolution in size and shape that he suggested rests on something more than theoretical advantages.—*Shipping*, Illustrated.

The effect of bilge keels on the speed of vessels formed the subject of a recent address by Naval Constructor David W. Taylor, U. S. Navy: "A United States battleship some time ago was tried with bilge keels. The bilge keels were afterward removed and the ship was tried over the same course, same displacement, same conditions as nearly as possible, and the ship took materially more power for a given speed with the bilge keels off—it was a matter of fully 100 horse-power—and although the experiments were not of a high order of accuracy there was no doubt there was more power taken when the bilge keels were off. That was something of a puzzle, but the answer is comparatively simple: The vessel did not steer nearly so well after the bilge keels were removed, and in running a trial, in trying to keep the ship to a straight course, they use more helm with the bilge keels off than with the bilge keels on. It takes only a very few degrees of helm to make a very decided dial on the vessel and increase the resistance. —*Shipping*, Illustrated.

NAVAL PARADE.—Five of the nations invited to take part in the great naval procession which will start at Hampton Roads and cruise by way of the Panama Canal to the Golden Gate next year have formally notified the State Department of their acceptance. They are the Argentine Republic, France, Germany, Great Britain, and Portugal. Japan also has decided to participate, and it is not doubted that nearly all the maritime nations of the world will be represented in the line.

Some of the countries have indicated a purpose to send naval officers to participate in the celebration of the opening of the great Canal, though they are not able to send ships, among them being Guatemala, Haiti, Honduras, Nicaragua, Salvador, and Switzerland.

The plans of the Navy Department call for the appearance in line of about 100 warships, 68 of them under foreign flags. The powers having great navies are invited to send each four ships and those with lesser naval establishments to contribute two each.

The exact date for the assembling of this international fleet has not yet been fixed, but under the terms of the act of Congress it must be early in 1915, and as the voyage from Hampton Roads to San Francisco will consume at least one month, the start must be made by the middle of January if the fleet is to reach San Francisco in time for the opening of the Panama-Pacific Exposition, February 20.—*Army and Navy Register.*

The latest change in the map of Africa is the amalgamation of Northern and Southern Nigeria into the single colony of Nigeria, dating from about January 1, 1914. The new colony has an area of 332,960 square miles and an estimated population of 18,000,000.—*Scientific American.*

NAVAL ACADEMY GRADUATES ASSOCIATION NOTES

By Professor D. M. Garrison, U. S. Navy

The Council of the Association met on March 10 and made the preliminary arrangements for the annual Alumni dinner. The annual meeting and dinner occur on Thursday, June 4, the day before graduation day. The meeting will be held in the officers mess building at 3.30 p. m., and the formation for dinner at 7.30 p. m. in front of Blake Row.

Last year saw the largest attendance in the history of the Association, over 300 being present. The largest previous dinner was that of 1912 when 145 were present. This growth of over 100 per cent in one year shows the great increase in interest amongst the graduate body, not only in the annual reunion: but with all that pertains to their alma mater.

The class of '68 are arranging a celebration fifty years from entrance, and from present reports about sixty are expected to attend. Class reunions at regularly recurring intervals tend to keep alive the class spirit. Every five years, on their fifth, tenth, fifteenth, etc. anniversaries each class should get together. Of course the logical place for such reunions is the Naval Academy, and the logical time is June week.

There are bachelor accommodations for any number in Bancroft Hall which may be occupied during the entire week, if so desired. These quarters are isolated from the Midshipmen body and are as private as one could wish. Such accommodations will be reserved upon application to the Secretary.

Those desiring to attend the dinner should indicate their intention to the Secretary long enough before June 4 that he may have ample time to make all necessary arrangements.

If it is found later on, that it is impossible to attend, the Secretary should be so informed, that table reservations may be cancelled. Last year in particular, it was found necessary at the last moment, due to every available seat being taken, to refuse seats to several who wished to attend. It was therefore a trifle

disconcerting to find at the tables a number of vacant chairs, which had been provided for graduates who did not show up.

A meeting of the Farragut Memorial Window Committee was held in Washington on March 10 for the purpose of examining the designs for the windows which have been submitted by the several competitors. The design or designs selected by the committee will be referred to the Fine Arts Commission in Washington for expert criticism.

The appeal in the last number of the PROCEEDINGS for addresses of 'lost' graduates, has met with considerable success, and quite a number of them have been located. Leaving the service, to some, means a complete burning of all their ships behind them. It should be remembered, however, that even if they have lost interest in their classmates and friends still in the service, those friends and classmates may still be interested in them and would like to know their whereabouts.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its forty-first year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The PROCEEDINGS are published every two months and anyone may subscribe for them. The annual subscription is $3.00; single copies, 50 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ESSAY, 1915

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession.

On the opposite page are given suggested topics. Essays are not limited to these topics and no additional weight will be given an essay in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. The award for the prize will be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1915. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the PROCEEDINGS of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the PROCEEDINGS of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages in the PROCEEDINGS of the Institute.

8. It is requested that all essays be submitted typewritten and in duplicate, if practicable; essays submitted written in longhand and in single copy will, however, receive equal consideration.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

E. J. KING,
Lieut. Commander, U. S. N., Secretary and Treasurer.

PRIZE ESSAY TOPICS

SUGGESTED AT THE INVITATION OF THE BOARD OF CONTROL

BY

THE PRESIDENT OF THE NAVAL INSTITUTE, THE SUPERINTENDENT OF THE NAVAL ACADEMY, THE PRESIDENT OF THE NAVAL WAR COLLEGE, AND THE COMMANDERS-IN-CHIEF OF THE ATLANTIC, PACIFIC AND ASIATIC FLEETS.

"The Mutual Relations of Gunnery and Tactics."

"The Place of the Naval Officer in International Affairs."

"The Evolution of Naval Doctrine from National Character."

"The Training of Enlisted Personnel to Produce Modern Man-o'-Warsmen: (a) Military Training; (b) Moral Training; (c) Education."

"The Organization, Employment and Training of Reserve Fleets and Flotillas."

LIST OF PRIZE ESSAYS

1879

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut.-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut.-Comdr. Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENSE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut.-Commander Yates Stirling, U. S. N.

1909

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotten, U. S. N.

1911

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

1912

Naval Might. Prize Essay, 1912. By Lieutenant Ridgely Hunt, U. S. N. (retired).

INSPECTION DUTY AT THE NAVY YARDS. Honorable Mention, 1912. By Lieut.-Commander T. D. Parker, U. S. N.

1913

The Greatest Need of the Atlantic Fleet. Prize Essay, 1913. By Lieut.-Commander Harry E. Yarnell, U. S. N.

NAVY DEPARTMENT ORGANIZATION. A Study of Principles. First Honorable Mention, 1913. By Commander Yates Stirling, Jr., U. S. N.

TRAINED INITIATIVE AND UNITY OF ACTION. Second Honorable Mention, 1913. By Lieut.-Commander Dudley W. Knox, U. S. N.

1914

The Great Lesson from Nelson for To-day. Prize Essay, 1914. By Lieutenant Commander Dudley W. Knox, U. S. Navy.

NAVAL POLICY AS IT RELATES TO THE SHORE ESTABLISHMENT AND THE MAINTENANCE OF THE FLEET. Honorable Mention, 1914. By Captain John Hood, U. S. Navy.

OLD PRINCIPLES AND MODERN APPLICATIONS. Honorable Mention, 1914. By Lieutenant Commander Dudley W. Knox, U. S. Navy.

MILITARY PREPAREDNESS. Honorable Mention, 1914. By Naval Constructor Richard D. Gatewood, U. S. Navy.

"TECUMSEH"

Figurehead of the U. S. Ship of the Line "Delaware," 1820